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SOME ASPECTS OF IRRIGATION FARMING IN CENTRAL OTAGO.

PROGRESS OF THE GALLOWAY DEMONSTRATION FARM.

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FARMING in Central Otago, where carried out under irrigation, presents many problems and more complexities than confront those farmers operating under normally humid conditions. Wherever irrigation is practised it can be assumed that the cost of production must be relatively high, the very application of water in itself entailing a considerable expenditure in time and labour. It naturally follows that in considering the utilization of irrigated country the aim must be the adoption of that type of farming which will not only keep labour at a minimum, but will at the same time give commensurate returns per acre.

Broadly speaking, there are two main groups of irrigation farmers in Central Otago. The larger group is dependent upon the returns obtained wholly from irrigated country; farmers of the second and probably more prosperous group have a portion of their properties under irrigation, this being utilized largely for the production of winter feed enabling the wintering of a greater number of sheep. There is no question that this second class has been greatly benefited by irrigation, and probably no type of irrigation farming has proved more valuable when viewed in regard to its ability to increase the earning-capacity of run country. However, only a small proportion of our irrigated country can be utilized in this manner; the greater part of the land is divided into self-contained blocks wholly supplied with irrigation water, the owners of these farms being dependent solely upon irrigation for their incomes.

In viewing the prospects of making a successful livelihood from such areas it must be recognized that no one type of farming can be recommended. The chief consideration, which almost invariably determines the class of farming primarily adopted, is the natural bent of the farmer himself, and often it is only after passing through many

vicissitudes and periods of instability that he finally reverts to the farming practice most suited to the soil-conditions of his farm, its aspect, elevation, and water-supply.

There is no doubt whatever that considerable extension of fruit-growing will eventuate on the irrigated country, and it is quite obvious that satisfactory incomes have already been derived thereby in the more favoured localities. It is not to be assumed that the bulk of the land in Central Otago suited to orcharding has already been devoted to that purpose. Many well-favoured situations still remain to be developed to a much greater extent than at present, and it is safe to say that the ultimate success and future prosperity of our irrigation communities will be largely concerned with the economic development of the fruitgrowing industry. Accordingly its stimulation by all possible means should be steadily kept in view. Apart from suitability of location, the extension of fruitgrowing as a means of securing a satisfactory livelihood depends largely on an expanding market and the economic utilization of surplus fruit in a preserved or dried form.

Unfortunately, in the past some areas unsuited to orcharding have been planted, with the result that to-day in certain sections a considerable number of trees have been rooted out and the orchards sown down to grass and lucerne. When it is realized that, comparatively speaking, only a small proportion of the irrigated country of Central Otago is suited to the growing of stone or pip fruits, the necessity will be appreciated for those farmers situated on sections not ideally suitable for orcharding to direct their farming activities in some other direction.

The question of growing cash crops on irrigated country is one which at present merits little consideration. Cereal-growing is obviously out of the question on account of the annual and consequently recurring labour costs entailed, and it would appear that of all farm crops the potato and onion crops are the only two which will repay the cost of irrigation and secure fairly remunerative returns. There is no question that small irrigated farms solely devoted to lucerne-growing for hay will in course of time be a payable type of farming for many small holders to adopt. The production of lucerne hay could, of course, not be increased indefinitely, and can only be regarded as practicable where labour is available and the farm situated in close proximity to the railway.

Generally speaking, the type of farming which must ultimately be adopted by farmers on moderate-sized sections is that devoted to the growing of grass and lucerne for the production of animal products. Consideration has been given to the raising of sheep on small sections, and probably for a few years a single person can earn more for his labour from sheep than he can from cows. It is easier for him to handle at least twice as large an area as the dairy-farmer, from the fact that his winter provision is easier to deal with, and the actual irrigation of his grassland need not be carried out in the same thorough manner as is necessary on a dairy-farm. The chief drawback to this type of farming under irrigation is that the sheep become so affected with foot-rot when confined solely to irrigated pastures that before long it is found impracticable to intensively work the farm with this class of stock.

Dairy-farming will undoubtedly play a most important part in the development of Central Otago, in so far as the small animal-product farms are concerned—largely on account of the fact that cows in general give a higher per-acre return than other classes of stock. This fact must automatically make dairying the type of farming most capable of yielding a satisfactory income off a small holding.

Galloway Irrigation Farm.

It is opportune to here briefly survey the work carried out on the Galloway Irrigation Farm, from the point of view that it affords an excellent illustration of the ability of arid country to be converted into first-class dairying-land. When taken over by the Department of Agriculture* this area of 148 acres was in a denuded condition, scab-weed, hair-grass, desert poa, and sorrel being the chief forms of vegetation on the land. Of the total area 90 acres are now under irrigation, and it is only this acreage that need be considered in relation to the development of dairying on the Galloway Farm; the remainder of the land, being situated above the race, is unirrigable, and hence worthless from the point of view of affording pasture for cows.

Dairying operations proper were commenced in the season of 1924–25, but prior to that year considerable initial development had taken place in regrassing the farm and in sowing down lucerne for winter hay. One of the principal drawbacks to a dairy-farm under irrigation is the fact that in commencing operations on a virgin block the farmer is immediately faced with the necessity of sowing down grass for summer feed, and at the same time he must make provision for winter hay by the growing of lucerne. This entails time and the expenditure of money, and in this respect irrigation farmers are handicapped compared with those farming under conditions of higher rainfall.

In 1924 18 acres of lucerne and approximately 40 acres of grass had been established, and dairy-farming was commenced with thirteen cows. The principal object of the farm was to ascertain the adaptability of cows to irrigated country, and to find out its carrying-capacity, in addition to determining the yield per acre of butterfat which might reasonably be expected from an average herd pasturing thereon. One of the chief aims, which has been rigidly kept in view, was to approach as nearly as possible to the conditions under which the average farmer might be working, and to this end all cows purchased for the farm were what could be regarded as ordinary animals. The herd in the main is composed of Ayrshires, with few outstanding cows. The slowness of this breed in reaching maturity renders its suitability for irrigated country open to question in some respects, but in all probability this characteristic is outweighed by the ability of Ayrshires to successfully withstand the rigorous conditions experienced during the cold winter months.

The growth of the herd has naturally been in direct relation to the carrying-capacity of the farm, and has steadily improved year by year. It is of interest to tabulate the progress in carrying-capacity from 1924

* A full account of the establishment of the Galloway Irrigation Farm and its initial operations was published in the *Journal* for October, 1926.

until the present season, bearing in mind that all winter feed used is grown on the farm. Particulars are as follows :—

Stock.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.
Milking-cows ..	13	28	38	46	56
Heifers	..	4	7	12	14
Calves	12	16	12	17	14
Bulls	2	3	4	2	4
Horses	4	4	4	4	3
Totals	31	55	65	81	91

The fact that 90 acres of irrigated country, using a supply of 33 in. of water per acre, can carry ninety-one head of more or less well-grown stock must be regarded as being an excellent example of the carrying-capacity of the better class of country in Central Otago. In this connection it is of further interest to record that no fertilizers had been applied to the pastures prior to the end of the 1927–28 season.

One of the major problems relating to irrigated pastures, as evinced at Galloway, is the predominance of clover and the tremendous flush of growth during the peak growing months of December and January. The tendency of all paddocks to bolt at this period has been most marked, and in past years it has been found impossible to control this state of affairs, with the result that the best use was not being made of the pastures. During the present season the larger paddocks have been subdivided into smaller areas of approximately 4 acres each. These are now being rotationally grazed, the whole herd of fifty-six animals being pastured on one paddock at a time, and after two or three days in that paddock moved to another one. Thus the bloom is first taken off the paddocks by the milking-cows, which are then followed by dry stock, these grazing the grass closely and cleaning up surplus feed. When the dry stock are removed the paddock is harrowed and then irrigated. In fourteen days' time or thereabouts the paddock is again ready to be grazed by the milking-stock. This method of rotational grazing is ideally adapted to irrigation, and, apart from the extra cost entailed in fencing, must ultimately play an important part in the successful management of an irrigated dairy-farm.

The comparatively short grass-growing season in Central Otago is responsible for lower herd averages than obtain in more favoured dairying districts. The Galloway herd, which, as already indicated, can be regarded only as an average farmer's herd, has been tested regularly, and it is interesting to note that the yield of butterfat for the season 1927–28 was 115 lb. per acre over the 90 acres of irrigated land. The season of 1928–29, not yet completed, will in all probability reach an average of not less than 137 lb. per acre. Calculating the over-all price of butterfat for the present season at 1s. 4d. per pound, this would return in gross receipts from butterfat alone the sum of £9 2s. 6d. per acre, which must be looked upon as quite satisfactory. Naturally this figure would be considerably increased if the cows were returning a higher average of butterfat per head, and unquestionably with selection and culling this could be accomplished very materially. The labour

entailed with a dairy herd of this size is quite considerable on an irrigated farm. At Galloway the services of a working manager and a full-time employee are necessary to cope with the milking of the herd and also to attend to the irrigation, while at harvest-time extra labour has to be employed. The total labour cost, therefore, on a 90-acre irrigated farm carrying fifty-six milking-cows is high.

For a dairy-farmer not employing labour outside the family probably 50 acres of irrigated country carrying twenty-five cows would be the maximum which could be reasonably handled, if the irrigation and harvesting of lucerne had to be attended to. In this respect the earning-capacity of a Central Otago dairy-farmer using irrigation is appreciably less than that of one in the more humid districts. Moreover, in the former case, chiefly for reasons of climate, the butterfat average per cow will usually be lower than in the latter.

There is no question that the income derived from dairy-farming can be considerably augmented by pig-raising, and with lucerne, skim-milk, and a dry climate pigs should thrive admirably and prove a valuable asset on an irrigated dairy-farm. During the season of 1927–28 fifty-six pigs were raised at Galloway, the gross receipts from these being £153. The utilization of skim-milk for this purpose is so far not being practised on the irrigated dairy-farms to the extent which it should be.

Concluding these notes, it may be claimed that, although no fortunes are to be made on the smaller irrigated farms of Central Otago, when the land is properly utilized and where sufficient water is obtainable to ensure adequate growth of crops comfortable homes can be established and satisfactory livings made.

SKIN ULCERATION IN PIGS.

A FORM of skin ulceration in pigs has recently come under notice of the Live-stock Division. The causative factor is found to be *Spirochaete suilla*, a soil organism associated with dirty yards and sties. The lesions set up are in certain respects similar to those caused by *Bacillus necrosis*, also a soil organism and met with in unsanitary yards and sties. The most common regions affected by the former organism are the head and ears, but later the trouble may spread to the shoulders and back.

Where this skin trouble has made its appearance it is advisable to segregate the affected animals. A thorough clean-up of the sties and disinfection of the entire premises is necessary. It may even be necessary in a badly infected site to transfer the piggery, or to build a new piggery on an entirely clean site. In the early stages scraping the skin slightly and the application of tincture of iodine or other antiseptic will assist in recovery of the affected animals.

That such troubles keep cropping up is only another illustration of the necessity of cleanliness and sanitation in connection with the feeding-troughs and utensils and the sties, and general attention to hygiene and care of the pigs. The old belief that pigs could live under almost any conditions is well recognized by the modern pig-keeper to be a fallacy, and conducive to diseases of many kinds and also to parasitic infestation.

—*Live-stock Division.*

TESTING OF PUREBRED DAIRY COWS.

REVIEW OF THE NEW ZEALAND CERTIFICATE-OF-RECORD SYSTEM IN 1928.

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THE total number of cows admitted to the first-class Certificate-of-Record classes during the calendar year 1928 was 465, which represents a decrease of sixty-four certificates from the preceding year. It is difficult to account for this continued falling-off in entries, more particularly when the testing of ordinary dairy herds continues to increase. It would seem a natural expectation that the trend of the two movements would more or less harmonize. Group and Association herd-testing provide information which should be used as a basis for herd-building, and herd-building is most quickly and effectively accomplished through the use of a registered purebred dairy sire with an approved butterfat-record pedigree. Such a pedigree is only possible to the most desirable extent when it is supported by particulars of certificates of record gained by the various females whose names appear in the pedigree.

More herd-testing would suggest an increased demand for C.O.R. sires, and it would appear likely that ere long there will be a shortage. The special-purpose dairy cow has come to stay, for the simple reason that she can produce food for human consumption cheaper than can any other animal. Further, an extensive investigation recently carried out has proved that the average purebred dairy cow will produce more butterfat and produce it more cheaply than will the average grade or crossbred dairy cow. This is even stronger evidence of the necessity for herd-building through the medium of a C.O.R. sire. One of the principal objects in introducing the Certificate-of-Record test was to provide dairy-farmers with sires which, because of their C.O.R. butterfat-record pedigrees, might be accepted almost as a guarantee of sound and rapid herd-building. It is recognized that the need for economy during recent years has been reflected in decreased C.O.R. entries—C.O.R. testing involving expenditure in the fees, and more particularly in the extra feed and handling called for. But we are of the opinion that those breeders who have carried on with the testing during the leaner years, and have kept their pedigrees complete with C.O.R. records by testing representatives of each generation as they came along, will one day reap the benefit.

A sire or dam with an extended pedigree complete with authenticated butterfat records is preferable to an animal whose ancestry is but sparsely supported by yield figures. Better animals must be bred on the foundation of proved production if satisfactory results are to be obtained. Heredity is the basis of all successful breeding practice. It should also be borne in mind that the mere fact of a bull being a registered purebred is not sufficient assurance of quality. It is creditable butterfat-production generation after generation which counts, and the C.O.R. test provides opportunity for acquiring the desired data in this respect.

The Official Herd-test, an adjunct of the C.O.R. system, is now in its second year, and that it is meeting with the approval of C.O.R.

breeders is evidenced by the fact that the current season's figures show a distinct increase over the first season's entries. There are at date of writing 1,666 cows on Official Herd-test, compared with 1,506 a year ago. The number of C.O.R. cows per C.O.R. breeder is slightly lower this year than last, the figures being 2·92 as against 3·1. Just how much of this decrease is due to the influence of the O.H.T. is doubtful. A review of the O.H.T. system in the 1928–29 season and a comparison with the preceding season will be published in the *Journal* at a later date.

Although last year's C.O.R. entries were somewhat disappointing, there is encouragement in the fact that for the month of January, 1929, some 665 cows were tested under the C.O.R. system, the number of breeders represented being 226, which is an increase of 40 breeders and 66 cows over the corresponding month of 1928.

From the point of view of average production of C.O.R. cows the position is satisfactory. A review of the past six years shows that while production can hardly be claimed to have advanced it has not fallen back. Combining all C.O.R. cows the average butterfat production year by year from 1923 to 1928, both inclusive, runs 468·45 lb., 470·99 lb., 467·92 lb., 463·87 lb., 469·56 lb., and 469·53 lb. respectively. This shows neither increase nor decrease, but a hovering round a point. The variation between one year and another is perhaps partly the result of climatic and general conditions, and partly because one year may be prodigal of outstanding producers and another year featureless in this respect. There is also reason for the assumption that our average purebred cow is reaching the limit of butterfat-production in conformity with her present stage of development, and that increased yield can only be expected to arrive slowly as the result of improvement in type, or methods of feeding and handling, or both.

FIRST-CLASS CERTIFICATES ISSUED.

The total number of cows which have received first-class certificates since the commencement of the C.O.R. system has now (to end of 1928) reached 6,187. In 1928 there were issued 410 ordinary first-class certificates and 55 certificates on repeat performance, making a total of 465 certificates for the year. The following table gives particulars of certificates issued during the past two years:—

Table 1.

Breed.	1928.			1927.		
	Ordinary.	Repeat.	Total.	Ordinary.	Repeat.	Total.
Jersey	328	39	367	333	50	383
Friesian	66	13	79	65	24	89
Milking Shorthorn ..	10	1	11	25	3	28
Ayrshire	3	2	5	16	1	17
Red Poll	2	..	2	10	2	12
Guernsey ..	1	..	1	..	..	..
Totals ..	410	55	465*	449	80	529†

* Representing 464 cows, one cow having qualified for two certificates within the year.
† Representing 528 cows, one cow having qualified for two certificates within the year.

SECOND-CLASS CERTIFICATES.

The number of second-class certificates issued during the year was once more but a small percentage of the total certificates gained, which signifies that testing breeders are doing all possible to have their cows calve within the fifteen-months limit required by the rules governing first-class certificate-of-record. The rules, of course, permit an extra thirty days—that is to say, sixteen months (485 days)—as the limit for the second class. Only twenty-two second-class certificates were issued in 1928. These included sixteen Jersey records with an average of 485·52 lb. butterfat, eight Friesians averaging 674·06 lb., one Red Poll with 305·51 lb., and one Ayrshire which yielded 638·80 lb. butterfat.

The average period between calving for test and calving subsequent to test for all cows which gained first-class certificates during the year under review was 390 days, being three days less than for the preceding year. The average period for the second-class certificate cows was 462 days, as compared with 468 days for 1927.

It is repeatedly noticed that there are some outstanding performances among the second-class certificate cows. In the year under review there was a Jersey junior two-year-old with 626 lb. butterfat, and a mature Jersey with 810 lb. There was a mature Friesian (Messrs. North and Sons' Rosevale Queen Sylvia Triumph) with 1,055 lb. butterfat; and two other mature Friesians are credited with 769 lb. and 785 lb. respectively. There was, too, an Ayrshire with 638·80 lb. butterfat. Although no doubt there are exceptions, the question arises whether there is not a tendency to hold some cows back from the bull too long, with the result that they fail to get in calf to the first or second service and thus calve too late for first-class C.O.R. In carrying the calf a shorter period of the 365 days test, the cow, of course, has more opportunity to produce to her maximum; but nature resents interference, and it is often worth while to sacrifice a few pounds of butterfat in order to assure a first-class certificate. It would appear, however, that the majority of our breeders are fully aware of this. The trouble of temporary sterility, which is fairly prevalent in the dairying districts, may also have had a part in some cases of late calving.

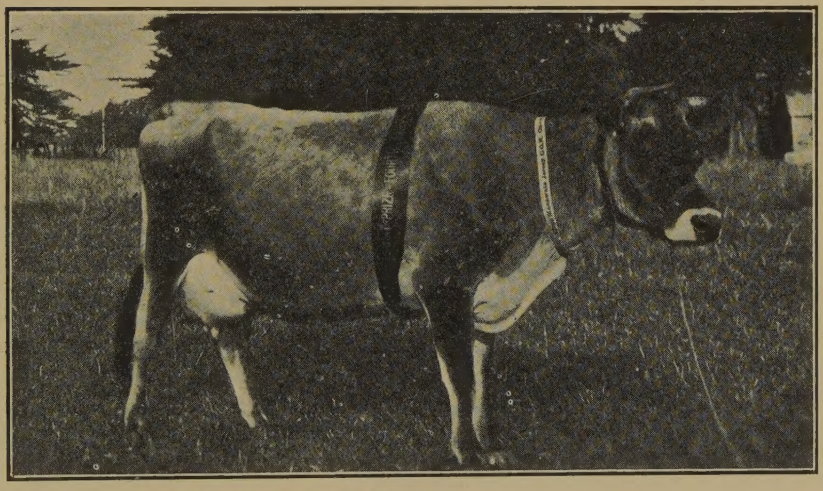
JERSEYS.

Class-leaders.

Although many good Jersey performances were recorded during the year, the list of class-leaders remains as at the end of 1927. Among the outstanding Jerseys of 1928 may be specially mentioned Mr. John Murray's (Woodville) Te Ngutu Memory, a junior two-year-old, which produced 647·28 lb. butterfat; Mrs. M. A. Jennings's (Mauriceville) Lisbury Zenith's Sultana, a senior two-year-old, with 734·87 lb. butterfat; Mr. J. J. Goodwin's (Morrinsville) Rexcourt Lady Magnet, a three-year-old, with 880·19 lb.; and Mr. J. G. Robertson's (Eltham) Craigalea Bonnie, a four-year-old, with 728·58 lb. The other classes, although containing a number of good performances, did not include any records which seriously challenged the existing class-leaders. The list is repeated in Table 2.

Table 2.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Ivondale Oxford Lass	R. S. Tuck, Waharoa..	1 338	240·5	365	12,107·7	731·29
Senior Two-year-old.						
Ivondale Golden Rainbow	P. J. Petersen, Waitara	2 311	271·6	365	12,962·2	768·46
Three-year-old.						
Ivondale Golden Lass	P. J. Petersen, Waitara	3 312	308·2	365	14,434·8	905·01
Four-year-old.						
Keston Flower ..	G. E. Yelchich, Waiuku	4 64	319·9	365	14,679·2	814·95
Mature.						
Holly Oak's Annie..	W. T. Williams, Pukehou (deceased)	5 9	350·0	365	18,522·7	1,056·49



TE NGUTU MEMORY (J. MURRAY, WOODVILLE).

C.O.R. in Jersey junior two-year-old class: 11,852·1 lb. milk, 647·28 lb. butterfat. Highest record for the class in 1928.

Jersey Class-averages.

The average C.O.R. Jersey for 1928 produced 456·92 lb. butterfat, as compared with 469·36 lb. for 1927, a decrease of 12·44 lb. It is noticeable, however, that there is a tendency for the junior two-year-olds to become an ever-increasing proportion of the entries for this breed. This fact must necessarily be reflected in the breed average. Some 367 cows were represented in 1928, as compared with 383 for 1927. Despite this decrease in the total cows it will be noticed that the

junior two-year-old class increased by seven cows, whereas the mature class dropped by thirteen. The only class of the five into which the breed is subdivided that showed an increase was the senior two-year-old. Although the membership of this class dropped by ten cows, the average production went up about 1½ lb. of butterfat. The average lactation period for Jerseys in 1928 was 346 days—three days less than for the preceding year.

The class-averages for 1928 and 1927 are given in the following table :—

Table 3.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1928.		lb.	lb.
Junior two-year-old ..	174	350	7,385·8	415·60
Senior two-year-old ..	33	349	8,046·0	455·06
Three-year-old	58	339	8,585·5	481·87
Four-year-old	37	348	9,108·6	498·11
Mature	65	339	9,396·4	522·78
	1927.			
Junior two-year-old ..	167	348	7,280·2	416·07
Senior two-year-old ..	43	348	7,950·9	453·54
Three-year-old	56	348	8,962·3	498·69
Four-year-old	39	354	9,394·0	520·35
Mature	78	353	9,669·9	545·63

Despite the fact that the average C.O.R. Jersey for 1928 yielded less than the average Jersey for 1927, the average of all certificates issued to Jersey cows since the commencement of the C.O.R. system in 1912 is higher at the end of 1928 than at the end of 1927. This, of course, is accounted for by the fact that the average for the twelve months under review is higher than the average from the commencement to the end of 1927.

The averages, class by class, of all certificates issued to Jersey cows since the commencement of the C.O.R. system are given in the following table :—

Table 4.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year-old ..	1,911	345	6,992·3	391·15
Senior two-year-old ..	520	344	7,715·8	434·11
Three-year-old	750	342	8,369·8	465·78
Four-year-old	464	345	8,844·2	490·47
Mature	1,195	345	9,308·3	510·50
All	4,840	345	8,032·9	446·32

Jersey C.O.R. Bulls.

By a C.O.R. bull is meant a bull which has sired four certificate-of-record daughters, each daughter being from a different dam. In the appended list certain names are marked †, signifying that these are the names of champion butterfat bulls. This is a special class recognized by the New Zealand Jersey Cattle Breeders' Association. A champion butterfat bull is one which has at least five daughters from different dams, and in addition each daughter must double its minimum butterfat requirements for certificate. Some 292 Jersey bulls have now qualified for the C.O.R. list. The list which follows includes those Jersey C.O.R. bulls which have added to their number of C.O.R. daughters during the year, or have during that period newly qualified for the class; space precludes printing the complete list of C.O.R. bulls. Seventy-six bulls are eligible for inclusion here, while up to the present fourteen bulls have qualified for the champion class, eight of these appearing in the list.

Table 5.

Key to numbers opposite names: First number—first-class C.O.R. daughters; second number—ditto, qualified on subsequent performances; third number—second-class C.O.R. daughters; fourth number—total of preceding numbers. Bulls marked * qualified for C.O.R. list in 1928.

Grannie's Knight†	56	15	4	75
Eminent's Fontaine	38	5	1	44
Viola's Golden Laddie†	28	6	1	35
V.C.†	22	3	0	25
Waipiko Masterpiece†	20	6	1	27
Hawkesbury Emperor†	18	6	0	24
Meadowvale Conqueror	18	3	1	22
Soumise Tom†	18	2	2	22
Belvedere Bilberry's Last	18	1	0	19
Bilberry's Goddington	16	3	0	19
Sweet Fox of Collingwood	15	2	0	17
Owler of Puketapu†	15	0	4	19
Brampton Merry Boy	15	0	0	15
Maid's General	14	2	1	17
Meadowvale General Daisy	13	1	2	16
Fox's Double	13	0	0	13
Woodstock Golden Lad	11	2	1	14
Distinction's Twylish	11	0	1	12
Ngahiwi Silent Knight†	11	0	0	11
Beachland's White Swan	10	3	0	13
Bright Sultan	10	0	0	10
Marshlands Masterpiece	10	0	0	10
Achievement of Willowbank	9	2	1	12
Sherry's Fox of Collingwood	9	2	1	12
Silver Conqueror	8	2	0	10
Exile of Cloverland	8	0	2	10
Clarion	8	0	1	9
Molly's Lad	8	0	1	9
Noble Warder	8	0	0	8
Lord Nelson	7	3	1	11
Golden Swan's Lad	7	3	0	10
Majesty's Squire	7	2	0	9
Willowbrook Lord	7	1	0	8
Centurian	7	0	0	7
Hawkesbury Majestic	7	0	0	7
Blondin	6	8	0	14
Xenia's Oxford Lad*	6	1	0	7
Eileen's Fox 2nd	6	0	1	7
Fernaig Exile	6	0	0	6
Marshal Aldan	6	0	0	6
Roto	5	2	0	7
Maids Egyptian General	5	1	1	7
Matchless Raleigh	5	1	0	6
Ironmaster of Meadowbrook	5	0	1	6
Anzac	5	0	0	5
Beachlands Lively*	5	0	0	5
Dominion Golden Cygnet	5	0	0	5
Grafton Pepper's Boy	5	0	0	5
Rower's Beautiful Prince*	5	0	0	5
Waipiko Lionello	5	0	0	5
Reid Park's Teasle	4	1	1	6
Golden Victor	4	1	0	5
Jersey Brae Majesty*	4	1	0	5
King Molina*	4	1	0	5
Meadowvale Gambollor*	4	1	0	5
Oakvales M. C.*	4	1	0	5
Orange Dale Draconis	4	1	0	5
Dominion Conqueror*	4	0	1	5
Pinewoods Golden O.K.*	4	0	1	5
Antrim*	4	0	0	4
Beachlands Little Swan*	4	0	0	4
Cute's Rozel Lad*	4	0	0	4
Fern's Golden King*	4	0	0	4
Flandrine's Golden Lad*	4	0	0	4
Holly Bank Hero*	4	0	0	4
Holly Oak Gander*	4	0	0	4
Ku Ku Corporal*	4	0	0	4
Ku Ku Scotty*	4	0	0	4
Leighurst General*	4	0	0	4
Maori French*	4	0	0	4
Maori Monarch*	4	0	0	4
Mercedes Golden Laddie*	4	0	0	4
Nominees Golden Laddie*	4	0	0	4
Rosemont Pilot*	4	0	0	4
Sunbeam's Sultan*	4	0	0	4
Waipiko Journalist*	4	0	0	4

FRIESIANS.

Class-leaders.

After remaining for almost five years without alteration, a change came to the Friesian class-leadership list in 1928. This change, which was referred to in detail in the *Journal* for November, 1928, occurred in the senior two-year-old class. Pareora Echo Blossom, bred by Mr. A. S. Elworthy, of Holme Station, Timaru, and tested by Mr. T. Sheriff, Clandeboye, gained a certificate for 819·81 lb. butterfat, thus displacing Mr. John Donald's Netherland Princess 4th, who had been the leader since the 1913–14 season, the second year of certificate-of-record testing in New Zealand. The margin between the two records was 14·04 lb. butterfat. The list of Friesian class-leaders is now as follows :—

Table 6.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
		Yrs. dys	lb.		lb.	lb.
Junior Two-year-old.						
Monavale Queen Bess	T. H. Richards, Cardiff	2 16	242·1	365	20,501·1	740·50
Senior Two-year-old.						
Pareora Echo Blossom	T. Sheriff, Clandeboye	2 223	262·8	365	22,671·9	819·81
Junior Three-year-old.						
Monavale Queen Bess	T. H. Richards, Cardiff	3 56	282·6	365	21,609·3	800·18
Senior Three-year-old.						
Manor Beets Daughter 2nd of Ashlynn	C. A. Hopping, Palmerston North	3 296	306·6	365	18,733·9	863·51
Junior Four-year-old.						
Westmere Princess Pietertje	John Donald, Westmere	4 156	329·1	365	24,199·0	939·78
Senior Four-year-old.						
Bainfield 27th ..	C. H. Potter, Pukerau	4 351	348·6	365	23,203·3	910·74
Mature.						
Alcartra Clothilde Pietje	Vernon Marx, Mangatoki	7 355	350·0	365	31,312·5	1,145·24

Friesian Class-averages.

Seven C.O.R. Friesian classes are recognized, and in 1928 four of these showed increased average production when compared with 1927. The average C.O.R. Friesian for the year is credited with 527·97 lb. butterfat, a substantial increase over the preceding year's figure of 502·09. Several of the classes are but sparsely represented, and consequently the average yield within such classes is too largely influenced by individual performances to be representative from a

comparison point of view. The mature class, however, is a particularly strong one, the average for the eighteen cows being no less than 651·74 lb. butterfat. As with the Jerseys, the junior two-year-old and the mature are the strongest classes numerically. A total of seventy-nine Friesians were certificated in 1928, as compared with eighty-nine in 1927. The average lactation period for all Friesians in 1928 was 352 days, five days less than for the preceding calendar year. The class-averages for the Friesian breed for the past two years are as follows :—

Table 7.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
	1928.		lb.	lb.
Junior two-year-old ..	27	339	12,586·7	430·79
Senior two-year-old ..	13	351	13,668·6	490·17
Junior three-year-old ..	5	320	12,345·1	449·25
Senior three-year-old ..	8	362	16,300·8	602·37
Junior four-year-old ..	4	365	17,406·8	604·63
Senior four-year-old ..	4	361	17,122·1	622·87
Mature	18	352	18,867·1	651·74
	1927.			
Junior two-year-old ..	32	346	12,250·0	432·18
Senior two-year-old ..	13	336	12,615·3	455·66
Junior three-year-old ..	7	345	14,681·3	502·82
Senior three-year-old ..	3	161	7,853·8	315·89
Junior four-year-old ..	4	359	17,275·4	610·31
Senior four-year-old ..	5	331	13,968·6	489·10
Mature	25	341	17,449·6	623·13

Tabulation of the averages, class by class, of all certificates issued to Friesian cows since the commencement of the C.O.R. system in 1912 evidences an increase in the production of the average certificated Friesian to the end of 1928, the present figure being 476·18 lb. butterfat, as compared with 473·58 to the end of the preceding year. The table is as follows :—

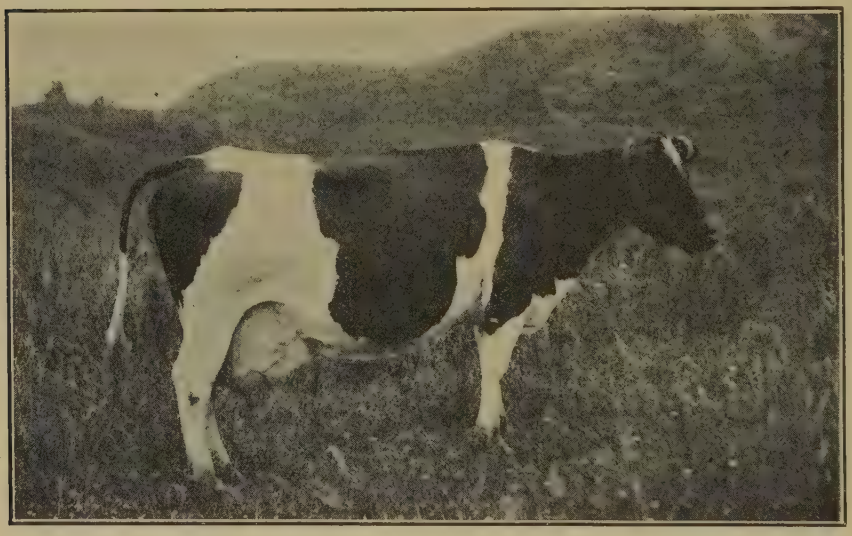
Table 8.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year-old ..	475	344	11,377·9	402·92
Senior two-year-old ..	216	346	12,347·5	438·00
Junior three-year-old ..	158	340	13,120·0	461·30
Senior three-year-old ..	154	336	13,664·8	488·79
Junior four-year-old ..	100	343	14,820·8	522·31
Senior four-year-old ..	95	347	15,631·2	542·68
Mature	459	339	15,639·5	547·03
All	1,657	342	13,515·1	476·18

Friesian C.O.R. Bulls.

The Friesian C.O.R. bulls now total ninety-five, and three of these qualified for their place in the C.O.R. list during the past year. The number of bulls of this breed entitled to appear in the present summary —that is to say, bulls which have added to their number of C.O.R. daughters during the year, or have during that period newly qualified for the class—is fifteen.

A glance through our bull records for the Friesian and Jersey breeds reveals an interesting position. To the end of 1928 some 4,263 Jersey cows had received certificates. These cows were by no less than 1,550 different sires. In all 292 Jersey bulls have qualified for the C.O.R. class, and these have sired 54·5 per cent. of the Jersey cows



ROSEVALE GLADYS POSCH (NORTH AND SONS, OMIMI).

C.O.R. in Friesian mature class: 28,555·2 lb. milk, 940·43 lb. butterfat. Highest record for the class in 1928, and the year's highest first-class certificate for all breeds.

certificated to date. Some 782 bulls had only one C.O.R. daughter, 296 had two, 160 had three, while 20 had four C.O.R. daughters, but not from different dams as required for C.O.R. qualification.

For the Friesian breed ninety-five bulls are in the C.O.R. class, and these have sired 57·3 per cent. of the 1,349 Friesian cows certificated to date. Altogether 481 Friesian bulls are represented in our C.O.R. list; of these 256 have sired one C.O.R. cow each, seventy-eight have two C.O.R. daughters, forty-eight have three, while four have four daughters not from different dams.

These figures are interesting, and go to show that while in many cases a sire's worth has been proved through the productive ability of his daughters, and that many breeders are continuing to breed along proven lines, there is a large proportion of cases in which the sire has been allowed to remain a more or less unknown quantity.

The list of Friesian C.O.R. bulls is as follows :—

Table 9.

Key to numbers opposite names: First number—first-class C.O.R. daughters; second—ditto, qualified on subsequent performances; third—second-class C.O.R. daughters; fourth—total of preceding three numbers. Bulls marked * qualified for C.O.R. list in 1928.

Rosevale Korndyke Sylvia Posch	18	14	3	35
Rosevale King Sylvia ..	16	3	5	24
Ensign Pontiac Valdessa Fayne	14	2	1	17
Dominion Woodcrest Piebe Mercedes ..	13	3	1	17
Echo Sylvia Sir Griselda	10	0	2	12
Marquis Segis Colantha	9	3	1	13
Woodcrest Pontiac Alcartra	9	3	1	13
Carnation King Matador Betty*	8	0	0	8
Rosevale Inka Sylvia Model	7	1	0	8
Rosevale Plus Triumph	6	6	1	13
Pietje Johanna de Kol ..	6	0	0	6
King Segis of Friesland Park	5	2	1	8
Bainfield Netherland King Pontiac* ..	5	0	0	5
Pareora Cadillac Hero ..	4	3	0	7
Rosevale Burke Posch*	4	0	0	4

MILKING SHORTHORNS.

Class-leaders.

There have been no changes during the year in the Milking Shorthorn class-leaderships, and with one exception no outstanding performances have been recorded. The exception is that of Dominion Conceit of Ruakura, a cow owned and tested at the Ruakura Farm of Instruction, Hamilton, which in the mature class made the very creditable record of 727·35 lb. butterfat. The list of class-leaders is here repeated :—

Table 10.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butterfat.
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Matangi Quality 4th	Ranstead Bros., Matangi	2 109	251·4	365	14,572·8	591·89
Senior Two-year-old.						
Matangi Quality 5th	Ranstead Bros., Matangi	2 204	260·9	365	11,752·8	542·66
Junior Three-year-old.						
Matangi Quality 4th	Ranstead Bros., Matangi	3 153	292·3	365	16,281·4	678·02
Senior Three-year-old.						
Matangi Ruth 2nd ..	Ranstead Bros., Matangi	3 304	307·4	365	14,032·7	747·86
Junior Four-year-old.						
Matangi Matilda 4th	Hon. Mrs. E. J. Blyth, Kohimarama	4 0	313·5	358	14,640·2	630·38
Senior Four-year-old.						
Matangi Ruth 2nd ..	Ranstead Bros., Matangi	4 355	349·0	340	11,670·3	644·90
Mature.						
Glenthorpe Lady ..	A. J. Melville, Buckland	Mature	350·0	365	20,136·2	856·85

DOMINION CONCEIT (RUAKURA FARM OF INSTRUCTION, HAMILTON).

C.O.R. in Milking Shorthorn mature class: 16,255·1 lb. milk, 727·35 lb. butterfat. Highest record for the breed in 1928.

Milking Shorthorn Class-averages.

Only eleven first-class certificates were issued to Milking Shorthorns in 1928, compared with twenty-eight for the preceding year. The average production for the eleven cows was 480·96, the previous year's figure being 445·82. In the year under review only four of the seven classes were represented, so that obviously a table of averages would be almost valueless from a comparison point of view, and consequently it is omitted this year. The eleven cows were made up of one junior three-year-old, which gave 334·46 lb. butterfat; three senior three-year-olds, which averaged 411·07 lb.; one senior four-year-old, with 409·66 lb.; and six mature cows, which gave the very creditable average of 552·21 lb. butterfat.

The following table shows the average, class by class, of all certificates issued to Milking Shorthorn cows since the commencement of C.O.R. testing for this breed in 1914:—

Table 11.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Junior two-year-old ..	47	351	8,446·4	346·06*
Senior two-year-old ..	24	347	8,511·8	347·17*
Junior three-year-old ..	20	335	9,507·2	378·93
Senior three-year-old ..	22	342	10,626·2	451·49
Junior four-year-old ..	18	349	10,883·2	440·58*
Senior four-year-old ..	24	343	11,859·5	466·83
Mature	227	340	11,624·0	464·23
All	382	342	10,849·1	436·19

* No additional cows for 1928

Milking Shorthorn C.O.R. Bulls.

Eight Milking Shorthorn bulls have now qualified for the C.O.R. class, and of these three are eligible for inclusion in the present summary. One C.O.R. bull added to his number of daughters, while two new names were added during the year. Particulars for the three bulls are as follows: Dominion Glaxo of Ruakura, 7–0–0–7; Acorn of Oakdale, 4–1–0–5; Dominion Banker of Darbalara, 4–0–0–4—the two last mentioned being the newly qualified bulls. (See key to numbers at head of Jersey bull list.)

AYRSHIRES.

Class-leaders.

One outstanding Ayrshire record was made during the year, and this brought a change of class-leadership. The cow referred to is Floss of Braeside, tested by Mr. W. Moore, of Homebush, Masterton. Her yield of 832·72 lb. butterfat increases the leadership of the mature Ayrshires—previously held by Mr. A. Montgomerie's Glencairn Brownie—by no less than 104 lb. The class-leaders for the breed are now as follows:—

Table 12.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season.		
				Days.	Milk.	Butter-fat.
Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Fair Maid of Greenbank	W. Moore, Homebush	2 27	243·2	365	12,281·3	673·56
Three-year-old.						
Ivanhoe Stylish Daisy	A. M. Weir, Menzies Ferry	3 312	308·2	365	12,334·2	574·09
Four-year-old.						
Ivanhoe Fancy ..	A. M. Weir, Menzies Ferry	4 308	344·3	365	14,207·7	713·93
Mature.						
Floss of Braeside ..	W. Moore, Homebush	7 287	350·0	365	20,305·5	832·72

Ayrshire Class-averages.

Only five Ayrshire cows received first-class certificates during 1928, and only two of the four classes into which this breed is usually subdivided were represented, consequently satisfactory comparisons with previous years cannot be drawn. One of the cows fell in the two-year-old class and gave 323·22 lb. butterfat. The other four, which were in the mature class, averaged 569·22 lb.; while all five averaged 520·02 lb.

The averages, class by class, of all certificates issued to Ayrshire cows since the commencement of C.O.R. testing in 1912 are shown in Table 13 (next page).

Table 13.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk	Milk.	Butterfat.
			lb.	lb.
Two-year-old	51	342	8,702·2	357·96
Three-year-old	30	345	9,817·3	402·29*
Four-year-old	23	347	11,263·3	455·57*
Mature	94	347	11,930·4	487·58
All	198	346	10,701·2	437·55

* No additional cows for 1928.

FLOSS OF BRAESIDE (W. MOORE, HOMEBUSH).

C.O.R. in Ayrshire mature class: 20,305·5 lb. milk, 832·72 lb. butterfat. New leader of her class.

Ayrshire C.O.R. Bulls.

No additions to the list of qualified Ayrshire C.O.R. bulls were made during the year. Seven bulls have qualified for the C.O.R. class to date.

RED POLLS.

The class-leaders for the Red Poll breed remain as at the end of 1927, and are reprinted in Table 14 (opposite page).

Only two Red Polls were certificated last year. These were owned and tested by the Central Development Farm, at Weraroa, and both were in the two-year-old class. Their average production was 275·68 lb. butterfat.

Table 14.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat required for Certificate.	Yield for Season		
				Days	Milk.	Butter-fat.
		Yrs. dys.	lb.		lb.	lb.
Two-year-old.						
Wayward 6th B No. 1	G. S. Young, West Plains	2 188	259·3	365	11,228·0	511·42
Three-year-old.						
Dominion Gold Top..	Central Development Farm, Weraroa	3 302	307·2	365	9,491·25	459·46
Four-year-old.						
Wayward 6th B No. 1	G. S. Young, West Plains	4 297	343·2	365	13,290·0	580·05
Mature.						
Dominion Sylph ..	Central Development Farm, Weraroa	5 4	350·0	365	11,009·00	505·84

The following table shows the averages, class by class, of all certificates issued to Red Poll cows since the commencement of the C.O.R. testing for this breed in 1918 :—

Table 15.

Class.	Number of Certificates.	Average Yield for Season.		
		Days in Milk.	Milk.	Butterfat.
			lb.	lb.
Two-year-old	35	342	7,543·5	333·96
Three-year-old	12	345	7,930·9	346·08
Four-year-old	6	343	9,909·1	425·86
Mature	18	331	9,972·3	421·32
All	71	340	8,424·7	365·92

Red Poll C.O.R. Bulls.

The Red Poll bull list remains unaltered. Three bulls have qualified, their names being Aviator, Belligerent, and Force Majeure.

GUERNSEYS.

The first Guernsey certificate under the New Zealand C.O.R. system was issued during the year under review. This went to Dominion Du Preel, who, commencing test at the age of 3 years 332 days, produced 487·46 lb. butterfat from 9,260·3 lb. milk in 365 days. As the prefix "Dominion" signifies, this cow is owned by the New Zealand Government, and she was tested at the Ruakura Farm of Instruction, Hamilton.

Considering the undoubted merits of the breed, it has always been somewhat surprising to us that the Guernsey has not been more strongly represented numerically in New Zealand. No doubt the principal difficulty lies in the matter of finance. Importation is expensive, and the problem of finding fresh blood is ever present.

Every few years new sires are required to counteract inbreeding, and as there are only some four (or perhaps half a dozen) Guernsey breeders in New Zealand, and these with small herds, importation becomes imperative if the breeding is to be continued successfully.

The Guernsey has established a favourable reputation in England, the United States, Canada, and even Australia. Climatically most parts of New Zealand should be ideal for Guernseys, and they are particularly fine butter-cows. In a general way the Guernsey is approximate to the Jersey in appearance, but is larger, somewhat rougher, and of more broken colour. The Guernsey is, of course, one of the Channel Island breeds, and it is held by some historians that she came from the same original stock as the Jersey, but was founded on the larger and more robust individuals. The fat in Guernsey milk has a pronounced yellow tint, and this fact originated the title of the "golden-butter breed" which has been bestowed upon it by the admirers of breed.

In her native home the Guernsey has many authenticated records around the 800 lb. to 900 lb. of butterfat mark, and in America more than half a dozen Guernsey cows have been credited with productions of over 1,000 lb. The merits of the breed will thus be apparent, and we are of opinion that the Guernsey could be introduced with advantage to many of our established dairying districts.

Once again the Dairy Division desires to extend its thanks for the help afforded by the secretaries of those breeders' associations co-operating in connection with the certificate-of-record testing. The C.O.R. work is now so firmly established that each year brings fewer calls for alteration of our system, and consequently fewer occasions on which it is necessary to enlist the assistance of the several association secretaries. Nevertheless, correspondence concerning entries, returns, &c., is frequently passing between us, and we have always found them untiring in their efforts to lighten our labours. In this connection we would record the names of Mr. W. M. Tapp (Jersey Cattle Breeders' Association); Mr. J. P. Kalaugher (Friesian Association); Mr. A. W. Green (Milking Shorthorn Association); Mr. R. H. Spencer (Ayrshire Cattle Breeders' Association); and Mr. L. J. Wild (Red Poll Cattle Breeders' Association).

LAWN-MOWER METHOD FOR MEASURING GRASS-YIELD.

The technique of frequent mowings as a measure of production is being tried at the Marton Experimental Area this season. The effect of applying two different kinds of phosphate at four different periods of the year is being tested. Cuttings are made at about fourteen days' interval. No attempt has been made to carry out cuttings at regular intervals, but it happens that a convenient growth for cutting (or grazing) occurs in about fourteen days. Hence it will be seen that a good measure of seasonal production is also obtained. Results up to the present indicate: (1) That there is no particular flush of growth about November, as is commonly supposed, but that production on a well-managed pasture is fairly uniform throughout the growing-season, providing rainfall is adequate and temperature suitable; (2) that superphosphate at 3 cwt. per acre on the land in question gives its maximum effect about six to eight weeks after application, when rainfall has been sufficient for plant requirements.

CONTROL OF RAGWORT WITH SHEEP.

Live-stock Division.

RAGWORT, which now infests large areas and is still spreading more or less throughout the Dominion, is a perennial plant and a free seeder, and on lands where it is allowed to flower and seed the ground becomes polluted. As the seed can lie dormant in the soil for some time, and will germinate when favourable conditions arise, some few years must necessarily elapse before the complete eradication of the weed on any given area can be claimed with any certainty. In addition to its propagation by means of the seed, the plant, which dies down in winter, each spring makes new and vigorous growth from its roots for some years before dying out. On tillable land control is a fairly simple matter, but there are large areas of infested bush grasslands only partially cleared of logs and stumps, which, at present at least, are unfit for tillage except at heavy preparation cost. Under such conditions other means of control must be resorted to by the progressive landholder.

Control of ragwort by means of sheep has for many years been carried out by settlers in both the North and South Islands with equal success, though under very different climatic conditions as between the far North and the far South. This method of attack has on many farms been an unqualified success, with practically no abnormal mortality among the stock, while mismanaged efforts on the part of neighbouring settlers have resulted in failure with heavy stock losses. All this goes to show that the human element plays a most important part in the control of ragwort, even when the simple means of eradication is grazing with sheep. By means of sheep, with proper handling, a fair measure of control of the weed can be attained in from two to three years.

When stocking lands badly infested with ragwort it has always to be borne in mind that the plant has often a most injurious and poisonous effect upon horses and cattle, but to a very much lesser degree upon sheep. Where it is possible to heavily stock the land with sheep during the late winter and early spring months, when pastures are more or less depleted and the ragwort growth is young and succulent, very good results are obtained. The plants are never allowed to seed, and in course of a few years a complete elimination of the weed is the result. For satisfactory control with sheep small paddocks are desirable where possible, in order to enable the changing of the sheep from field to field, thus obviating the fouling of the pastures. Experience has proved that aged ewes are the best class of sheep to employ for clearing ragwort country, these being less effected by the toxic principle of the plant than younger sheep. Again, these old sheep are found to eat the soft crown out of the ragwort in spring, which is fatal to the plant. Younger sheep are more apt to leave the crown alone and pay more attention to the outer leaves, which means a slower measure of control.

A method sometimes employed is to leave the weed until it is in full flower and then turn a large mob of sheep on it, in order that they may devour the flowers and upper leaves of the plant and thus prevent

its seeding. This plan, however, is not generally advocated, as if the sheep are left on the ragwort too long while it is in this very rank and more dangerous stage the mortality is sometimes heavy, and many of the carcasses are found on slaughter to be very yellow in colour. This method can be advised only in cases where the sheep can be moved on to clean pasture after a few days on the flowering weed. In any case it cannot compare with the before-mentioned plan of stocking up in the late winter and early spring. Sheep possess a fair immunity to the poisonous elements of well-cropped ragwort, and can be kept on infested country for a more or less lengthy period without ill effects, provided the weed is kept well grazed down and is not allowed to grow rank or to flower. On some lands where the ragwort had obtained complete control, with consequent smothering out of all other pasture, the feed consists of ragwort and little else. It is unwise to keep any class of sheep, whether old ewes or not, on such feed for more than one season, otherwise in the second and subsequent years a heavy loss from cirrhotic liver trouble may result. Such sheep when rounded up soon show that all is not well with them. In order to minimize the possibilities of trouble, sheep grazing on infested land should be enabled to obtain a fair quantity of good herbage in addition to the ragwort.

Control of ragwort on purely dairying-country presents more difficulties in the matter of control than is the case where the land can be given over more or less entirely to sheep. On many comparatively small dairy-farms very good results in respect to ragwort control have been obtained by grazing a few aged ewes with the dairy cows during the late winter and spring and early summer months. After the first month or so there is ample feed for both the cows and sheep, and the old ewes keep down the ragwort, so that little if any is allowed to flower and seed. Then, when the season is well advanced and before the pasture begins to wane, the sheep, with lambs at foot, are sold off, in most cases at a profit. Small paddocks are of distinct advantage in the control of the weed on these dairy-farms also.

Top-dressing of infested patches of ragwort with fertilizers is also a great help in the control of ragwort and other weeds, owing to the stimulation of the grass pasture and making it more palatable to the stock, thus promoting the trampling down and crushing out of the weed.

Reports have been obtained recently from Stock Inspectors, some of which state in no uncertain terms that on many farms ragwort is now under complete control. Dairy-farmers on badly infested lands have, with the assistance of ewes, subdivision of the larger fields into smaller ones, and regular moving of stock from field to field, improved their farms in carrying-capacity and appearance out of knowledge, with little or no loss of stock from ragwort poisoning. Instances given are as follows:—

"A."—Area of farm 280 acres, easy hills, fair amount of flat. When first occupied fifteen years ago ragwort was distributed over the whole area. For first seven years grazed sheep only, then added dairying to his other activities and has since carried sixteen to twenty-two cows besides a flock of ewes. At present is milking on the area twenty cows and grazing four hundred ewes. Country thoroughly

clean, and owner quite satisfied that ragwort can be easily controlled by good fencing, small paddocks, and judicious stocking. Has had no deaths attributable to ragwort.

"B."—Area 200 acres, easy hills, fair amount of flat. Three years ago was covered with heavy ragwort. Farm was given over to sheep-grazing and is still carrying sheep only. No sign of ragwort for some time past, and country has appearance of excellent condition. No mortality among sheep reported.

"C."—Area 110 acres, about a quarter of area under ragwort. Some years ago lost eleven head of cattle and two horses from ragwort poisoning. Was advised to place sheep on ragwort area, and procured seventy old ewes in March, 1927. Ewes kept on country practically ever since, and no sign of ragwort noticeable. No further deaths from ragwort. States ragwort now gives no trouble, and only wishes he had known value of sheep control earlier. Throughout whole period has also milked from twenty-five to thirty cows.

"D."—Area 120 acres. First occupied fifteen years ago when land was practically free from ragwort. Eight years ago found ragwort becoming plentiful, and purchased a number of sheep to control it. Now winters approximately one hundred and fifty sheep, mostly ewes, and thirty-three cattle, twenty-five of these being dairy cows. Farm is now practically free from ragwort. No deaths attributable to ragwort. Owner satisfied that the weed can be effectively controlled with ewes without loss to the farmer's profits.

"E."—Area approximately 120 acres. First occupied by present owner fifteen years ago. Ragwort then bad in patches. Has always carried a number of ewes to control the weed. Milks twenty-five cows and carries one hundred ewes. Native-owned property nearby, which for years carried no stock and which was infested with ragwort, is now stocked with sheep and now no ragwort visible. Is a firm believer in the control of ragwort on dairy lands by means of sheep.

Leading points for farmers to bear in mind are: (1) Division of farm into reasonably small paddocks, with good sheep-proof fences; (2) carrying of sheep—old ewes for preference—unless to be replaced each year; (3) moving of stock regularly from field to field; (4) top-dressing of infested patches where it can be done; (5) sheep to be put on dairy-farms in late winter for preference, if not intended to be kept throughout the whole year.

LINSEED-RUST CONTROL WORK.

In a recent report the Director of the Plant Research Station, Palmerston North, states: "The J.W.S. linseed now being grown in New Zealand by arrangement with the Empire Marketing Board (350 acres this season) was unfortunately contaminated with linseed rust when shipped here. It is highly necessary to secure clean lines of this seed for future sowings, and an attempt has been made to treat seed so that a clean crop could be secured. The treatment, however, has not been successful, and it will be necessary to fall back on the selection of individual healthy plants for the production of a nucleus line of healthy seed. In the case of this rust it is not definitely known whether the disease is actually carried in the seed or whether contamination of a line is due only to teleutospores being present amongst the seed. If the disease is mainly transported as teleutospores in seed-samples there should not be any great difficulty in hand selection for freedom from the disease."

MATURITY OF APPLES IN RELATION TO LONG STORAGE.

SOME TRIALS WITH THE IODINE TEST.

M. DAVEY, Horticulture Division, Wellington.

THE question of the best stage of maturity at which to pick fruit to ensure efficient long storage, and the elimination of waste during storage from physical defects and fungus rots, has exercised the minds of those engaged in the fruit industry for many years past. The results of practice, rather than definite tests, have led to the present generally accepted conclusions regarding the most desirable condition in which apples should be gathered, and this has led to a fair degree of success only.

Dealing with apples and pears, one finds that there still exists a wide divergence of opinion regarding the correct time at which these fruits should be harvested to ensure long storage, and it would appear that unless some other method than that of macroscopical examination is employed no finality is likely to be reached regarding a matter which is of primary importance when applied to pip-fruits, and possibly to other fruits rich in starch or sugars and intended for long storage or transport.

As long ago as 1905 it was shown by Bigelow, Gore, and Howard that the process of ripening, so far as the conversion of starch into sugar in apples was concerned, could be followed by the use of iodine solution; and as recently as 1927 Carne and Wickens carried out tests with iodine solutions in an endeavour to solve the problem or reduce the losses incidental to the development of bitter-pit in apples during storage.

Our Department of Agriculture, conscious of the fact that the occurrence of bitter-pit in some varieties of apples, particularly Cox's Orange, is possibly aggravated by picking in the early stages of maturity, decided to carry out tests this season on the lines indicated by previous investigations. Although the tests are only in the initial stages, it has been considered advisable to publish a brief progress report on the information at present available.

The recently taken photographs here reproduced indicate the process of starch conversion to sugar in the apple, which takes place quite rapidly, and which may ultimately decide that a very limited period indeed exists in which certain varieties of apples may be harvested to the best advantage. It is necessary to explain the effect derived by application of the iodine solution to the flesh of the apples, which have been cut in half equatorially. Immersion of the cut surface for the brief period of half a minute shows a starch reaction of an iron-grey to blackish-purple, according to the variety of apple and degree of immaturity, while those portions of the flesh in which starch conversion has taken place show little or no reaction, according to the completeness of the change.

The six Cox's Orange apples in Fig. 1, which were highly coloured, show practically no conversion of starch, with the exception of Nos. 5 and 6, which indicate a slightly matured condition round the core.

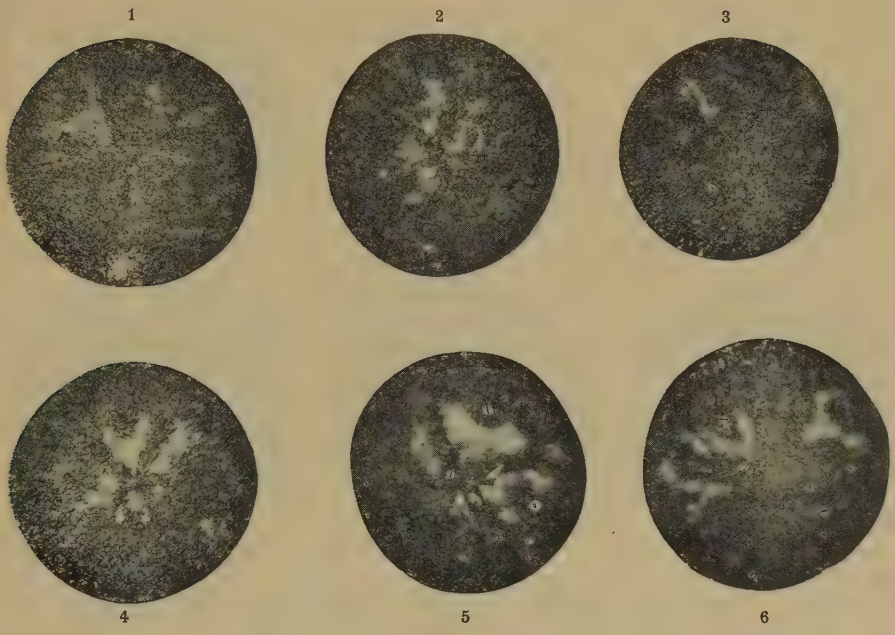


FIG. 1. SECTIONS OF HIGHLY COLOURED COX'S ORANGE APPLES AFTER IODINE TEST, SHOWING IMMATURITY OF FLESH.

The speckled appearance on cut surface is due to free moisture. In this and the other photos the specimens are reduced from natural size.

FIG. 2. APPLES FROM SAME TREES AS THOSE IN FIG. 1, PICKED EIGHT DAYS LATER, SHOWING CONVERSION OF STARCH TO SUGAR.

Top row 216, bottom row 175 pack size.

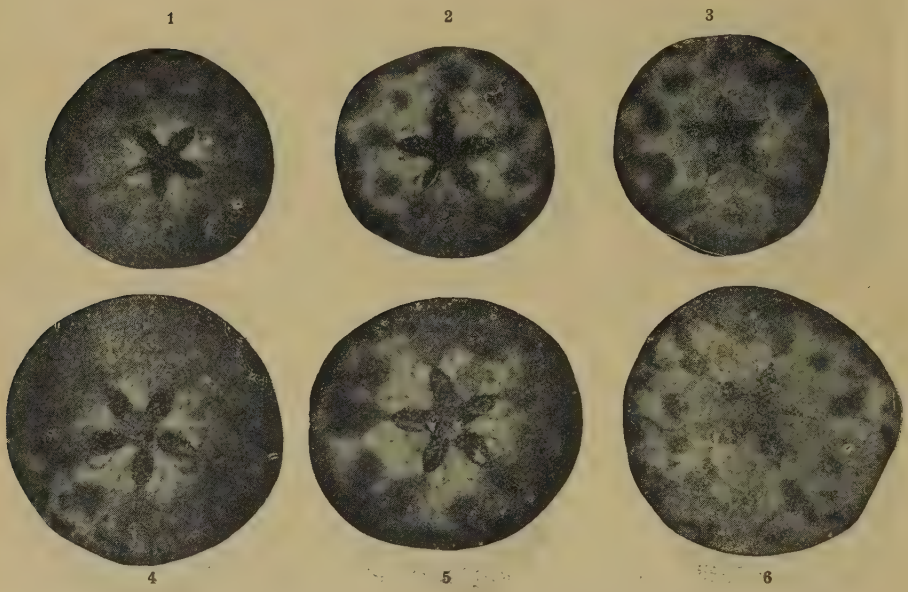


FIG. 3. HIGHLY COLOURED WORCESTER PEARMAIN APPLES, SHOWING WIDE DIFFERENCES OF MATURITY BY IODINE TEST.

Top row 198, bottom row 139 pack.

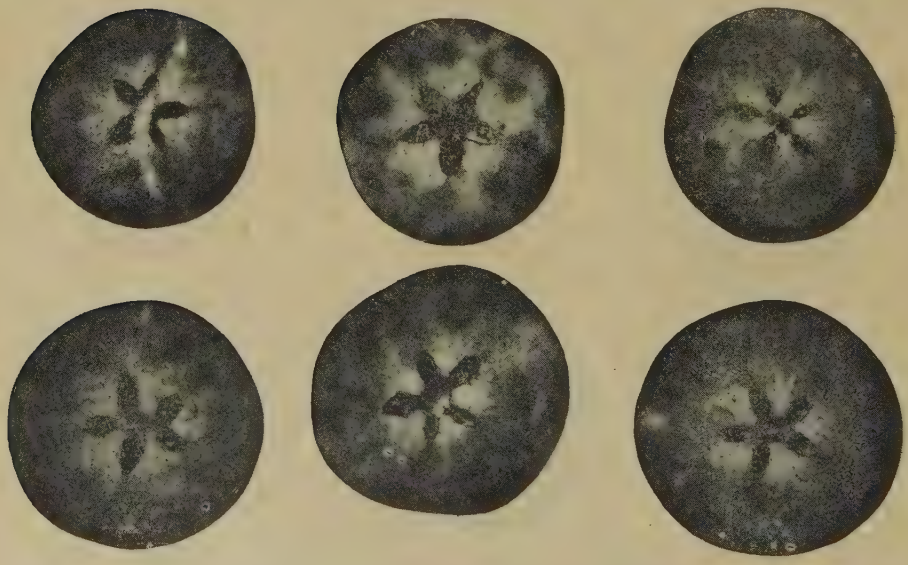


FIG. 4. POORLY COLOURED WORCESTER PEARMAINS, SHOWING UNIFORM MATURITY OF FLESH BY TEST.

Top row 198, bottom row 138 pack.

In contrast to this condition, Fig. 2 shows a general and uniform condition of starch-conversion extending to the surface of the fruit, although this fruit was picked only eight days later and from the same trees as that shown in Fig. 1.

W. M. Carne, Plant Pathologist, Department of Agriculture, Western Australia, puts forward the theory that bitter-pit is due to the actual picking of the fruit in an immature condition. He considers that it is caused by a loss of water from the fruit as a whole, which is finally borne by the more immature cells, resulting in their drying-out and death. This effect on the immature cells is caused by the irregular manner in which apples ripen, the more mature or sugar-filled cells being in close association with less mature starch-filled cells. As the result of osmotic action, the sugar-filled cells draw water from the starch-filled cells. If the loss from the latter is sufficiently great they are killed.

If one accepts this line of reasoning it can be easily understood that the sudden severance of a supply of sap from tree to fruit, brought about by picking, would aggravate bitter-pit at a stage when the moisture-content of the cells is high, and would suggest that the safer procedure would be to delay picking until such time as the maturity had reached the stage shown in Fig. 2.

Coming to the Worcester Pearmain variety, Fig. 3 shows sections of highly coloured fruit with a greenish-yellow ground colour, while the apples in Fig. 4 were very poorly coloured fruit, the ground colour being light green. The highly coloured apples show wide differences of maturity under the iodine test, although the amount of colour on each apple was 90 per cent. The poorly coloured apples (only 10 per cent. colour) under test show uniform maturity, indicating that red colouring is only a superficial effect in indicating flesh maturity. Particular note should be taken of apple No. 1 in Fig. 3, which was a very highly coloured fruit even in its class, but which under test shows less maturity than any of the green apples in Fig. 4. An iodine test of a similar number of Worcester Pearmain apples, applied nine days previously, showed very slight starch-conversion, and this closely confined to the core, again indicating that harvesting might be delayed with advantage until the fruit reached the stage shown in the more matured specimens of Figs. 3 and 4.

Fig. 5 shows effects which are not so conclusive. The six Jonathan apples, picked at the same time from the same tree, the apples being of exactly similar appearance externally, indicate a wide range of maturity under the iodine test. Nos. 1 and 2 show a uniform starch-conversion extending to the surface of the fruit. Nos. 3, 4, and 5 show practically no starch-conversion, while No. 6 appears to show quite an advanced stage of maturity. The condition of this apple, which carried a grass-green ground colour, opens up the question of whether apples of the same variety contain a widely different starch content. This specimen seems to indicate that at least a small proportion of individual fruits do differ in this respect, and the type of fruit represented by it is consistent with this assumption, this particular apple being one of those soft, spongy fruits lacking flavour and sweetness even when maturity is fully developed and the entire starch content converted into sugar.

FIG. 5. JONATHAN APPLES, ALL OF SIMILAR EXTERNAL APPEARANCE (10 PER CENT. COLOUR) AND PICKED AT SAME TIME, SHOWING WIDE RANGE OF MATURITY BY IODINE TEST.

Top row 175, bottom row 150 pack.

CONCLUSION.

While these experiments are only in the initial stages it would be imprudent to draw any very definite conclusions from the results, but the effects seem to indicate—

(1) That a great chemical change in the composition of apples takes place in a comparatively short time.

(2) That in consequence the operations of picking and placing the fruit in cool storage to control that process of maturity may have to be undertaken and carried out more rapidly than under present practice, in order to secure maximum life for the fruit in storage.

(3) That red colouring is to some extent misleading when considered from a maturity point of view.

Research on Phormium tenax.—The Chairman's report at last month's meeting of the Research Council included the following reference to this subject: "Considering the finance available, the work of the Phormium Research Committee, under Mr. Seifert, and at Massey Agricultural College, shows very favourable promise. Dr. J. S. Yeates reports very promising results from hybrid seedlings. A special assistant has been appointed to investigate yellow-leaf disease, while several investigations into problems connected with preparation and uses of the fibre are being actively pursued."

PASTURE MANAGEMENT.

INTENSIVE GRAZING FOR CANTERBURY CONDITIONS.

M. J. Scott and D. J. Sidey, Canterbury Agricultural College, Lincoln.

It has long been known that all grazing-stock thrive best when the grass is kept moderately short. The ideal state for a pasture is from 2 in. to 4 in. high, and scientists have proved that grass in this young-leaf stage is as highly nutritious as any concentrated food. In order to keep grass in this stage it is necessary to adopt the system of intensive grazing. This is really not a new procedure, having been carried out in the Channel Islands in particular for many years, but it has been brought very much into prominence of late by work and experiments carried out in England and the Continent of Europe.

If farmers are asked at the present time what is the limiting factor in the carrying-capacity of their farms they will mostly reply that it is either the dry spell in the late summer and early autumn, or the period when grass-growth is dormant in winter and early spring (or both). This being so, it must be evident that it is a difficult problem to keep the grass at the best stage of its growth during the spring and summer months, with the number of sheep limited by the carrying-capacity during the period of scarcity. Top-dressing, which is being so largely adopted to increase the quantity of grass grown, although it may give an earlier and a later growth, only serves to intensify this problem of keeping the grass short during the flush season.

Thus it would seem that the better utilization of the existing pasture should be the first consideration of the farmer. When it is found that the maximum return is being obtained from the grass-growth in the flush season, then will be the time to look to methods—such as top-dressing, better strains of pasture plants, &c.—of increasing the amount of grass that grows.

INTENSIVE GRAZING.

Briefly summarized, intensive grazing means putting as many stock as possible on to an area so as to feed off all the grass on it in from two to four days, then shifting the stock on to the next area, grazing it moderately bare in turn, and then moving the stock on again. Then, depending on the number of areas to be grazed and the rate of growth of the grass, in the course of ten days or so the stock are brought back to the first area, made to graze it moderately bare again, and then once again shifted round the other fields. This means that a paddock is grazed hard for three or four days and then completely spelled for eight to fifteen days. This system of grazing means, with the best grassland, having from thirty to fifty sheep per acre on each paddock for the three or four days they are grazing, and eight to twelve sheep on poor country. This, however, does not mean that paddocks have always to be specially subdivided. On country carrying two sheep per acre the acreage of the paddocks requires to be about one-eighth of the number of sheep grazed—for example, 100 acres for 800 sheep. On country carrying six sheep per acre the area of the paddocks should be one twenty-fourth of the number of sheep—thus 10 acres for 240

sheep, or 20 acres for 500 sheep. If the paddocks are already of reasonable or nearly equal size, then concentration of the stock in one or more mobs of such size that they can clean up a field in from three to five days—that is all that is necessary. Supposing a farmer has twelve fields of pasture of nearly equal size, then instead of having his sheep in about six or eight mobs scattered over all the fields he would concentrate them in two mobs, move each mob round four or five paddocks as circumstances might demand, and leave the remaining fields as standbys, to be used ultimately for hay or ensilage.

It is usually found advisable to have two classes of stock to do the grazing. First the highest-producing stock, either ewes and lambs or milking-cows, are allowed to eat the pick of the grass, and then second-class stock, called "followers" (usually dry sheep or cattle, as the case may be), clean up the fields. If the stock available cannot clean the grass up moderately bare, then it is necessary periodically to run the hay-mower over the fields.

By this system of grazing the grass is never allowed to get away to innutritious stem. The chief object of natural plant-growth is to produce seed, and once this object is achieved growth practically ceases for the year and the stock have to live mainly on the low-feed-value seed-stalks. If, on the other hand, this object is defeated by controlled grazing methods, then the plant continues to grow so that it may be able some time to produce seed, and thus not only does the stock have young fresh leafage to eat all the time but a longer grazing-period is also obtained.

Intensive grazing increases the number of stock carried, and entails a greater outlay on conserving winter fodder. At present the stock carried on any farm is *levelled down* to the carrying-capacity of the worst time of the year, whether it is autumn, winter, or spring. Business houses and financiers object, and rightly so, to increasing stock when everybody wants them in flush seasons like the present one, because of the fear of having to sell them on a falling market as soon as a period of scarcity is encountered. To these people the intensive system of pasture management would appear to be objectionable in that it demands more stock. This stock, however, is a permanent increase, and probably one of the greatest benefits to be derived from this system would be doing away with the necessity for dealing in stock in good or bad seasons. Intensive grazing proposes to *level up* the stock carried so as to consume about two-thirds of the maximum growth of grass in the growing-season, and to save the remaining one-third as hay or ensilage for winter fodder for the increased number of stock. Where a man is now carrying 200 sheep, letting his grass go to seed, and taking, say, 25s. net per head from them, we suggest that he can carry between 300 and 400 sheep, keep his paddocks intensively grazed, and take 18s. to 20s. net per head. The difference between 18s. and 25s. being spent in extra labour on saving hay and feeding it out.

It may be said that the saving of this hay or ensilage to improve and increase the food available during times of scarcity, and so indirectly the amount of stock carried, would be uneconomical. If we consider that the present stock carried on a farm is bearing the burden of rates, rent, taxes, &c., then any extra stock will be carried without this burden.

Supposing, for example, a farmer is carrying one sheep per acre on £10-per-acre land, and that his rent or interest, rates and taxes, &c., amount to 10s. per acre, then his present one sheep carries this burden, but any extra sheep are kept without it, and so he can afford to pay 10s. per head extra on their keep.

During last season the College farm wintered 100 old ewes on hay and oat sheaf, together with what little grazing there was on a 20-acre paddock. The cost of extra feed was only 7s. per sheep, so the sheep could be well fed and the labour of hand-feeding easily paid for on 10s. per head. In addition, the margin of 5s. per head, less profit allowed for, over all the sheep carried is more than sufficient to cover the cost of feeding even in the worst seasons. The net profit after making these deductions of 5s. per head for all sheep and 10s. for extra sheep wintered is about 75 per cent. greater than would be made with the lesser number as carried at present.

One ton of hay will winter ten sheep for four months, and if 10s. per sheep is allowed for winter keep this puts the hay value at £5 per ton, and at this price a 2-ton-per-acre crop of hay gives a return that is worth while. Then in seasons like the present a farmer would be able to put aside nearly twice the usual hay crop, part of which could always be carried on as an insurance against a future bad season.

Under Canterbury mixed-farming conditions the whole organization of the farm is utilized for saving the grain crops in good condition, extra labour is employed, and the cost is borne because an immediate cash return is in sight. The conservation of winter fodder, however, is not treated in the same serious manner, and is often a matter of chance, largely because the cost looks prohibitive and there is no immediate cash return. When the final results from this saved winter feed, especially if it is in good condition, are made really apparent, then the operation of saving the feed can be undertaken as keenly as harvesting, and the returns will be equally pleasing.

SOME OBJECTIONS TO INTENSIVE GRAZING.

Several objections are raised against this system of grazing, and one is the fact that there is a tendency for the fields to become foul. In actual practice, however, this tendency is not nearly so marked with true intensive grazing, as the fields have a relatively long spell during which the effect of the rain or the heat is to clean the fields, especially where sheep are grazed. The use of a scattering harrow may be necessary occasionally with sheep, and it is essential with cattle on account of the size of the droppings. On the other hand, with extensive grazing or badly carried out intensive grazing this cleaning-up is seldom allowed to take place.

Another objection levelled against intensive grazing is that it induces scouring; but here again, where the system is carried out effectively, practice would seem to disprove this. With intensive grazing the stock are always getting much the same class of feed—young fresh grass—whereas with extensive grazing, changes in feed due to weather conditions, varying types of pasture, and grass-growth are more likely to have an upsetting influence. While on this point it

may be pointed out that scouring due to rust poisoning (if such a term is correct) would not occur on intensively grazed paddocks, owing to the absence of rust from young stemless grass.

That disease will be more prominent on intensively grazed paddocks is also a theory held by some farmers; in actual practice, however, the opposite is often found to be the case, as during the spelling-period the pasture gets a proper chance to clean up. Much of the disease at present found in flocks or herds is due to unsuitable feeding at some period, and so the balancing of the feeding, by intensive grazing and saving more reserve fodder, will help to eliminate some of the stock-diseases now present.

EFFECT OF INTENSIVE GRAZING ON GRASSLANDS.

Many farmers, especially in Canterbury, hardly realize the great possibilities in grassland farming. At present a fairly common practice is to crop a piece of land until it is full of weeds and will no longer produce a payable cereal crop, and then sow it down in grass to give it a spell, during which time it builds up its fertility again. Under this system of sowing down, combined with bad grazing, it is hardly any wonder that pastures run out even on good land. On the other hand, if the land in good heart were to be sown down to grass, and the grass grazed intensively, there would be not nearly the same trouble with the grass going out and weeds coming in. The returns to be obtained would be as profitable, if not more so, than those from any other branch of farming, and the soil would be built up instead of being depleted. In regard to pastures "running out," one often hears it said, especially in Canterbury, that red clover disappears from the pastures after two or three years. The cause of this disappearance may be partly due to unsuitable strains of clover, but it can also be traced to the grazing methods. Clover-plants do not like shading, and our present system of grazing, under which the grass is allowed to produce flower-stalks, thus shading the clovers, is one reason why the latter die out. Any farmer who has cut hay off the same field for several years in succession has probably noticed that after the second or third year the clovers and fine grasses which will not stand shading have died out, and that coarse grasses have taken their place. Much the same thing happens with extensive grazing.

Again, when the grass is allowed to run to seed-stalks it stops growing and dries up just about the time the red clover is coming into prominence. The sheep avoid this stemmy grass and graze on the clover only, never giving it a chance to produce any leafage; consequently it cannot build up a strong rooting-system and is eaten out.

EXPERIMENTAL WORK AT LINCOLN.

An experiment has been carried out on a field of 12 acres at the College during the past few months, and the results so far obtained are very gratifying. Four acres of the field were grazed under the old system of grazing, care being taken to get the maximum return possible under this system, and it carried sheep at the rate of six sheep per acre from 10th October to 14th January. After being spelled for a fortnight following the latter date there was only fair feed on this area. The remaining 8 acres were divided into eight 1-acre sections,

and two mobs of ewes and lambs each grazed rotationally on four sections, dry sheep being used as occasion demanded to clean up the surplus pasture. These sections averaged 10½ sheep per acre over the above-mentioned period, and at time of writing there is still an excellent growth of fresh clover and rye-grass on them, so much so that an experiment is being carried out in the fattening of lambs on this pasture. In the first grazing experiment we obtained an increase of 169 lb. of live-weight lamb per acre during the period mentioned from the extensively grazed area, and 264 lb. live-weight lamb increase per acre from the intensively grazed area, or an increment of about 56 per cent.

It is hoped next year to widen the scope of this work, so as to include various types of pasture and soil and various classes of stock. It is also pleasing to note that in those few instances in Canterbury where intensive grazing is being done the farmers concerned are well pleased with the results. Information regarding any such practical experiences will always be appreciated.

CONCLUSION.

An attempt has here been made to show how the system of intensive pasture management can be made use of—particularly on mixed farms in Canterbury—for increasing the cash returns from stock in general and from sheep in particular. It is necessary in an article of this kind to make general statements, and although every farmer has particular circumstances that decide his course of action, if he follows the outlines of the scheme we feel sure that the results—in the increase of stock carried, in the improved condition of this stock, and in the better pastures that must ultimately be established—will more than repay him for his extra labour and care.

As sheep-farming is the more important branch of animal husbandry in Canterbury, references in this article are mostly concerning sheep. However, with certain limitations, what is true of sheep is also true in the main of cattle.

CERTIFICATION OF GRASS AND CLOVER SEED.

"It has been hoped that opportunity would be afforded this year to carry out considerable certification of at least white clover and brown-top," reports the Director of the Plant Research Station, "but circumstances will only allow of a certain amount of old-pasture white-clover certification. This work is connected up with the Welsh and Scottish Plant Breeding Stations, and seed from all certified crops is to be put on trial by these institutions as well as in New Zealand. On the area at Palmerston North over one hundred commercial samples of brown-top are being grown, and it is obvious that several very distinct strains are present, and the comparative merits of these require to be worked out before any satisfactory certification can be adopted. In addition it may be mentioned that among these samples there are three which consist almost entirely of true *Agrostis stolonifera*. This seed at the present time is not in the trade in any part of the world, and South German bent-grass (which contains only a small percentage of true *stolonifera*) commands 6d. per pound premium over New Zealand brown-top for that reason. It is clear that where *stolonifera* could be marketed as such it would command a quite fancy price, and in order that this might be done certification based on actual examination of the growing crop is necessary."

CLEANLINESS OF THE CREAM-SEPARATOR.

DEMONSTRATED AS ESSENTIAL TO KEEPING-QUALITY OF CREAM AND SEPARATED MILK.

G. F. V. MORGAN, N.D.A., N.D.D., Dairy Bacteriologist, Wallaceville Laboratory.

THE separator is one of the most important links in the chain of good cream-production. It cannot be too strongly emphasized that the whole chain is just as strong as its weakest link, and that the links extend from the supplying dairy to the pasteurization plant at the factory.

The most important points in the production of good cream to consider are (1) The cleanliness of the milking-machine; (2) the cleanliness of the separator; (3) the cleanliness of the cream-can. Of these points the separator is a very important item, as it is capable of having a most harmful effect if improperly cleaned and looked after.

The process of separation always slightly increases the bacterial count of milk however clean the separator may be kept by breaking up the chains and clumps of germs that may have entered from the milking-machine, or that may have originated in the cow's udder. This, however, makes little difference to the keeping-quality of the cream, though it makes a rather marked difference to that of the separated milk. It must be remembered that the separator is a centrifugal machine, and that the tendency is for a large proportion of foreign bodies in the milk, among which may be included bacteria yeasts and moulds, to leave the separator with the heavier skim-milk rather than with the lighter cream, or else to remain in the slime which is always to be found adhering to the bowl and plates of the separator after use.

For reasons already explained, this slime contains a large proportion of the germs originally present in the milk, more particularly the larger bacilli, most of which are bad "weeds" in dairy-produce and cause the worst ultimate effects, usually leading to rapid putrefaction rather than to normal clean souring.

Germs, of the bad type particularly, are collected from day to day in the course of separation, and provide an ever-increasing contamination of the cream. The necessity of taking down the separator and cleaning it thoroughly after each use is therefore quite obvious.

CLEANING THE SEPARATOR.

Apart from removing the slime or more visible dirt, every part of the separator that comes into contact with the milk or cream should be thoroughly washed and cleaned, and finally scalded. This removes the film of milk that remains over all the parts of the separator through which the cream or milk passes.

This thin film of milk, if allowed to remain, forms one of the best media for bacterial growth and multiplication, and the few germs that may have been introduced into the separator with cleanly

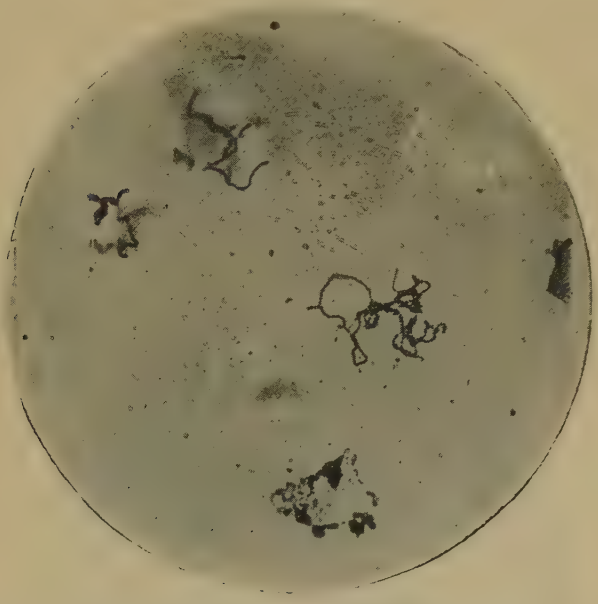


FIG. 1. TYPE OF BACTERIAL CHAIN WHICH IS BROKEN UP BY ACTION OF SEPARATOR AND DISTRIBUTED THROUGH THE BODY OF CREAM AND SEPARATED MILK. (HIGHLY MAGNIFIED.)

FIG. 2. SHAKE CULTURE SHOWING A GOOD BACTERIAL COUNT (WHITE DOTS) PER 1 CUBIC CENTIMETRE OF CREAM.

produced milk will reproduce rapidly before the time the separator is next used, forming a considerably increased source of contamination for the following separation. Again, if this film is allowed to remain for a period of several days, and is continually being replenished by fresh cream and milk already containing bacteria, the number of germs or bacteria in the separator itself will be sufficient to cause the cream to sour or develop bad flavours very shortly after separation. Experiments recently carried out at the Wallaceville Laboratory show the degree in which a badly cleaned separator can increase the germ content and reduce the keeping-quality of the cream and separated milk.

FIG. 3. CULTURE SHOWING A MEDIUM BACTERIAL COUNT.

REASONS FOR AND ADVANTAGES OF STERILIZATION.

Thorough cleaning and scalding, as will be shown in the tables to follow, very markedly increase the keeping-quality of the cream, and a further considerable increase can be obtained by steam-sterilizing for half an hour, at as near boiling-point as can be managed, all parts of the separator through which the cream or milk passes. This can usually be done quite simply by placing a convenient receptacle with a perforated bottom and a lid over a copper, allowing the steam to enter and keep circulating for half an hour. It must be remembered that however clean utensils may appear after washing, it is impossible to wash them free from germs, and that most germs found in dairy-produce are capable of resisting scalding water for a considerable time. The only sure way of rendering utensils sterile is by using live steam for a sufficient length of time, and experiments have shown that half an hour is the minimum time in which thorough sterilization may be

expected. Results have shown that sterilization will add an additional day and a half to the keeping-quality of cream above that of the well cleaned and scalded separator.

Experiment with Separator at Wallaceville.

The appended tables were compiled from the results of experiment with two series of samples taken during the same fortnight, in warm weather, during which the temperature varied from 65° to 78° F. Samples were taken from the milk before separation as control samples; samples of the first separated milk to leave the separator and of the first cream were then taken; samples of the final cream and final separated milk were also taken, and finally of the slime remaining in the separator after use. In each case the separator was well cleaned before starting the series, and thoroughly sterilized.

The first series shows the results of leaving the separator uncleaned from day to day; the second series shows a very marked improvement when washing and scalding are carried out from day to day, and also indicates the extra keeping-quality obtained by washing and sterilizing by live steam after use.

Table 1.—Separator sterilized at Start of Experiment, then left.

Sample.	Bacterial Count per Cubic Centimetre.	Condition.	
First Round.		At 4 Days.	At 5 Days.
Milk	80	Sour	
First cream	170	Sweet	Sweet.
First separated milk	3,240	Sour	
Last cream	100	Sweet	Sour.
Last separated milk	3,400	Sour	
Slime from plates	110		
Wash-water	130		
Second Round.		At 3 Days.	At 4 Days.
Milk	100	Sour	
First cream	9,800	Sour flavour	Sour.
First separated milk	6,000	Sour	
Last cream	9,600	Sour flavour	Sour.
Last separated milk	20,400	Sour flavour	Sour.
Slime	2,400		
Third Round.			
Milk	60	Sweet	
First cream	600,000	Sour	
First separated milk	452,000	Sour	
Last cream	Uncountable	Sour	
Last separated milk	500,000	Sour	
Slime	198,400		
Fourth Round.			
Milk	130	Sweet	
First cream	650,000	Sour	
First separated milk	500,000	Sour	
Last cream	Uncountable	Sour	
Last separated milk	Uncountable	Sour	
Slime	390,500		
Fifth Round.		At 2 Days.	At 2½ Days.
Milk	80	Sweet	Sweet.
First cream	500,000	Sweet	Sour.
First separated milk	650,000	Sour	
Last cream	Uncountable	Sweet	Sour.
Last separated milk	Uncountable	Sour	
Slime	300,000		

Table 1—continued.

Sample.	Bacterial Count per Cubic Centimetre.	Conditions.	
Sixth Round.		At 1½ Days.	At 2 Days.
Milk	120	Sweet	Sweet.
First cream	800,000	Sour	..
First separated milk ..	750,000	Sour	..
Last cream	Uncountable ..	Sour	..
Last separated milk ..	Uncountable ..	Sour	..
Slime	280,000	..	..
Seventh Round.		At 1 Day.	
Milk	180	Sweet	..
First cream	Uncountable ..	Sweet	..
First separated milk ..	Uncountable ..	Sour	..
Last cream	Uncountable ..	Sweet	..
Last separated milk ..	Uncountable ..	Sour	..
Slime	Uncountable ..	..	..
Eighth Round.		At 1 Day.	
Milk	90	Sweet	..
First cream	Uncountable ..	Sour	..
First separated milk ..	Uncountable ..	Sour	..
Last cream	Uncountable ..	Sour	..
Last separated milk ..	Uncountable ..	Sour	..
Slime	Uncountable ..	..	..
Ninth Round.		At ½ Day.	
Milk	190	Sweet	..
First cream	Uncountable ..	Sweet	..
First separated milk ..	Uncountable ..	Sour	..
Last cream	Uncountable ..	Sour	..
Last separated milk ..	Uncountable ..	Sour	..

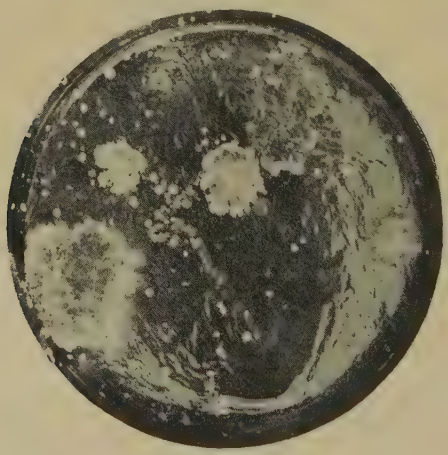


FIG. 4. CULTURE SHOWING BAD BACTERIAL COUNT (SMALL WHITE DOTS), TOGETHER WITH MOULDS (TO RIGHT AND LEFT), AND THREE LARGE COLONIES OF BACILLUS SUBTILIS (ABOVE CENTRE).

Table 2.—Separator sterilized at Start of Experiment, then taken down and washed and scalded after each Round.

Sample.	Bacterial Count per Cubic Centimetre.	Condition.		
First Round.		At 3 Days.	At 4 Days.	At 5 Days.
Milk	200	Sweet	Sweet	Sweet.
First skim-milk	6,000	Sour	..	..
First cream	260	Sweet	Sweet	Sweet.
Last skim-milk	2,560	Sour	..	..
Last cream	230	Sweet	Sweet	..
Slime	700	..	..	..
Second Round.			At 3 Days.	
Milk	1,680	..	Sour	..
First skim-milk	3,680	..	Sour	..
First cream	1,300	..	Sour	..
Last skim-milk	7,040	..	Sour	..
Last cream	1,800	..	Sour	..
Slime	5,280	..	..	..
Third Round.		At 2 Days.	At 3 Days.	At 4 Days.
Milk	180	Sweet	Sweet	Sweet.
First skim-milk	2,040	Sweet	Sweet	Sour.
First cream	1,340	Sweet	Sweet	Sour.
Last skim-milk	900	Sweet	Sweet	Sour.
Last cream	1,200	Sweet	Sweet	Sour.
Slime	760	Sweet	Sweet	Sour.
Fourth Round.				
Milk	220	Sweet	Sweet	Sour.
First skim-milk	3,680	Sweet	Sour	Sour.
First cream	1,250	Sweet	Sweet	Sour.
Last skim-milk	4,200	Sweet	Sour	Sour.
Last cream	1,200	Sweet	Sweet	Sour.
Slime	330	..	..	..
Fifth Round.		At 3 Days.	At 4 Days.	At 5 Days.
Milk	140	Sweet	Sweet	Sour.
First skim-milk	2,200	Sweet	Sour	..
First cream	1,300	Sweet	Sweet	Sour.
Last skim-milk	1,250	Sweet	Sour	..
Last cream	1,230	Sweet	Sweet	Sour.
Slime	200	..	..	..
Sixth Round.		At 3 Days.	At 4 Days.	At 5 Days.
Milk	340	Sweet	Sweet	..
First skim-milk	2,500	Sweet	Sour	..
First cream	1,020	Sweet	Sweet	..
Last skim-milk	1,720	Sweet	Sour	..
Last cream	540	Sweet	Sweet	..
Slime	1,860	..	..	..
Seventh Round.				
Milk	59	Sweet	Sweet	Sour.
First skim-milk	810	Sweet	Sour	Sour.
First cream	140	Sweet	Sweet	Sour.
Last skim-milk	180	Sweet	Sour	..
Last cream	50	Sweet	Sweet	Sour.
Slime	680	..	..	..
Eighth Round.				
Milk	110	Sweet	Sweet	Sour.
First skim-milk	1,920	Sweet	Sour	..
First cream	270	Sweet	Sweet	Sour.
Last skim-milk	300	Sweet	Sweet	Sour.
Last cream	230	Sweet	Sweet	Sour.
Slime	1,360	..	..	..

Table 2—continued.

Sample.	Bacterial Count per Cubic Centimetre.	Condition.		
Ninth Round.				
Milk	46	Sweet ..	Sweet ..	Sour.
First skim-milk ..	780	Sweet ..	Sour ..	..
First cream	680	Sweet ..	Sweet ..	Sour.
Last skim-milk ..	230	Sweet ..	Sweet ..	Sour.
Last cream	380	Sweet ..	Sweet ..	Sour.
Slime	2,320	..	..	..

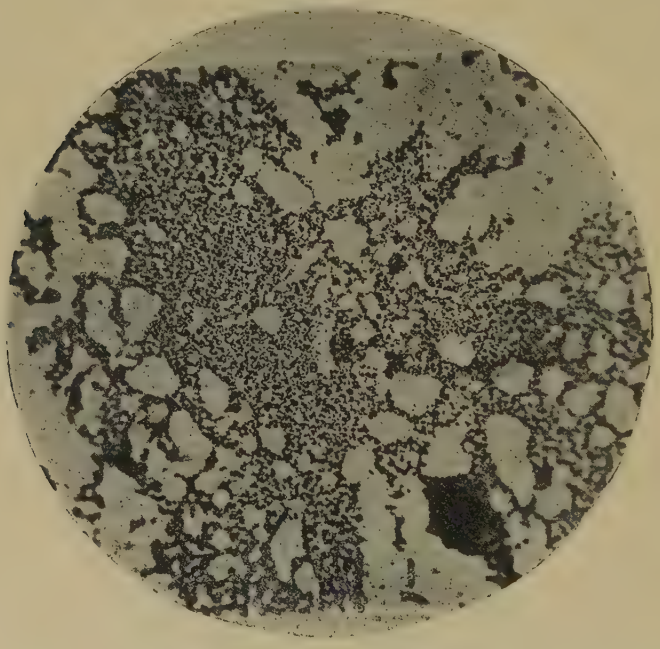


FIG. 5. CULTURE OF BACTERIUM COLI. (HIGHLY MAGNIFIED.)

This is one of the commonest and worst contaminations, frequently caused by dirty utensils and separators. A frequent cause of gassy fermentation in cream.

It will therefore be seen that separators should be thoroughly cleaned and scalded. This means little extra time and trouble, and will greatly improve the quality of the cream. Sterilization of all parts of the separator, wherever possible, is also strongly to be recommended.

Export of Purebred Dairy Cattle.—During the calendar year 1928 seventy-six head of purebred dairy cattle were exported from New Zealand. Of this total four went to New South Wales, ten to Victoria, four to Fiji, four to New Caledonia, fifty-one to Tonga, and three to Samoa.

BLOOD SCOURS IN CALVES DUE TO COCCIDIOSIS.

LOCAL OCCURRENCE DETERMINED.

C. S. M. HOPKIRK, B.V.Sc., Officer in Charge, Wallaceville Veterinary Laboratory.

FOR some time past officers of the Live-stock Division have been suspicious that bloodstained scouring in calves in some of the dairying districts might possibly be due to a parasitic disease known as coccidiosis.

Recently a farmer in the Hutt Valley, near Wellington, brought in a small quantity of fæces from such a case, giving the following history: Several years ago the majority of his calves died in a small paddock set aside for calves. This paddock was not abnormally damp in winter, but water did lie about to some extent; during the summer the paddock was dry. Deaths occurred in the summer and early autumn. Following the first mortality, several of his calves died annually, until three years ago he gave up trying to rear calves. Every calf that died did so with symptoms of dysentery. This year he had two calves he wished to save, and put them back into the same calf-paddock. Both died, though no calves had been in the paddock for three years. As far as this farmer has noticed, there have been no cases of persistent scouring in his adult herd.

Fortunately I was able to secure the intestines of the last calf to die, and easily demonstrated typical coccidiosis—an ulceration of the rectum due to the entrance, into the cells of the mucous membrane, of this parasite, a species of *Eimeria*, probably *Eimeria Zurnia*. The fæces also contained many of the resistent stage of the organism, known as the oocyst.

The life-cycle of this parasite is an interesting one. The oocyst is dropped on to the ground with the fæces. In it four daughter cells form, which divide again into two sporozoites. At this stage the parasite has been swallowed by another calf, and the sporozoites, of which there are now eight, in the original oocyst are set free and attack the cells of the mucous membrane, one sporozoite to one cell. These sporozoites enlarge, and in them many asexual bodies known as merozoites are found, each of which attacks a new cell when liberated, so setting up the ulceration. If conditions become unfavourable for the parasite after several asexual cycles female elements are formed, the male fertilizing the female to form the oocyst, a very resistant body and the one which is left on the ground in calf-paddocks to infect future generations. An oocyst has been known to remain alive and able to infect for at least two years.

Calves affected are not easily treated. In Canada the following mixture is prescribed: Sulphate of iron, two parts, sulphur, two parts; salt, six parts. They use 50 lb. of the mixture with 100 lb. of linseed-cake to 100 head per day, and continue treatment for two weeks, which works out at ½ lb. of tonic to 1 lb. linseed-cake per calf per day. Other workers claim results with enemas of 1 per cent. tannic acid

or 1 per cent. alum. For poultry, thymol is given in the drinking-water; with calves a dram of thymol dissolved in the milk might be tried for a period of four days, followed by a dose of castor-oil.

Prevention is also difficult unless particular care is taken. It is best to provide an entirely new calf-paddock, and to use new feeding-tins, &c. If necessary to retain the old paddock, it must be thoroughly ploughed and well limed right to the fence-line. Sheds also require to be sprayed with a 1-per-cent. solution of disinfectant such as Jeyes fluid.

In order that we may find out exactly which species of *Eimeria* (*Coccidium*) infests New Zealand calves, farmers having cases of blood scours are requested to let the nearest Stock Inspector know, so that specimens may be forwarded to Wallaceville. Not all cases of blood scours are due to this parasite, but the specimens forwarded will assist in deciding what the proportion is. Farmers should bear in mind that the condition, once present on the farm, requires energetic measures in order to combat it.

OCCUPATION AND UTILIZATION OF LAND IN NEW ZEALAND, 1927 AND 1928.

THE following table summarizes the condition of occupied land in New Zealand for 1927 and 1928:—

	1927.	1928.
	Acres.	Acres.
Orchards, market gardens, vineyards, nurseries, and seed-gardens	31,252	31,416
Field crops	1,769,862	1,689,369
Area occupied by residences, outbuildings, gardens, &c.	64,783	68,566
Fallow land	124,003	124,187
Sown grasses	16,680,348	16,871,530
Phormium tenax (New Zealand flax)	69,420	66,492
Tussock and other native grasses	14,197,853	14,091,717
Fern, scrub, &c.	4,123,743	3,976,134
Plantations—		
Conifers	139,087	200,513
Eucalypts and broad-leaved trees	21,101	31,570
Standing virgin bush	4,099,032	4,000,683
Barren and unproductive land	2,267,214	2,303,277
Totals	43,587,698	43,455,454

In this table "barren" land is defined as that which is incapable of being put to profitable use, and not merely that which is barren because unused. Types of this land are mountain-tops, cliff-faces, shingle-beds, &c. It must be recalled that this table does not profess to give the condition of all land, as the total area of the Dominion is 66,390,262 acres, whilst the area occupied in 1928 was returned as 43,455,454 acres—a difference of 22,934,808 acres.

—*Census and Statistics Office.*

FIREWOOD ON THE FARM.

A. R. ENTRICAN, Engineer in Forest Products, New Zealand State Forest Service.

To the farming community, more than to any other group in the Dominion, is a plentiful supply of wood fuel important. The farmer is often located far from a railway-siding, which in its turn may be hundreds of miles from a coal-producing region. This source of fuel, therefore, is denied him except at an almost prohibitive cost, and he must look to his plantations, perhaps to the small patches of native bush hidden away in odd valleys on the farm, or sometimes to adjacent bush and milling operations, for the major portion of his fuel-supply. In urban centres, too, wood remains an important fuel even in the face of competition by gas, electricity, coal, and oil. It is the most widely used of all kindling-materials, and is extensively employed in open fireplaces, in cooking-ranges, and under washhouse coppers.

PLANTING FOR FUEL WOOD.

It is unwise for either rural or urban communities to rely upon the chance growth of trees for their future firewood-supplies. It is not unusual for the farmer and firewood-dealer to be compelled to go farther and farther back each year for their wood, or to cut smaller trees each succeeding year, because the available supply is too small to allow the trees to attain to the proper size for cutting. This condition may be prevented by adequate tree-planting measures, such as those initiated many years ago in Central Canterbury. Here the acute shortage of trees for shelter and other purposes in the early colonizing days promoted the establishment of immense shelter-belts and plantations. To-day both urban and rural communities draw a valuable supply of cheap wood fuel from these woodlots. Yet even here care must be taken that if the cut exceeds the growth new plantations are formed to make up the deficiency and to guard against future shortages.

What has been achieved in Canterbury can be achieved in every other section of New Zealand. There is available for planting a wide range of both softwoods and hardwoods which will yield annually from two and a half to seven cords of wood per acre, according to the species and soil or site quality. Since the average farmstead uses only from five to fifteen cords of fuel wood per annum, it is clear that most settlers will have sufficient inferior land, suitable for tree-growing but not for agriculture, which will maintain a plantation for the continuous supply of firewood. Many farmers indeed possess sufficient inferior land suitable for tree-growing on a much larger scale, which would add to their income in supplying firewood to neighbouring urban centres. Local bodies, too, might with advantage establish plantations for the benefit of the community. This is a common practice in France, where the communal forest is a feature of village life, supplying as it does to the inhabitants both their fuel wood and other timber requirements.

WHAT TO USE FOR FIREWOOD.

For reasons which will become apparent later on in this article, it is best to plant trees which will not only grow fairly rapidly but also produce wood of high density or weight per cubic foot. Undoubtedly for fuel wood alone the eucalypts as a group are the best, but farm plantations will produce such a wide variety of other products than firewood, such as posts, poles, construction and building timbers, &c., that, except where absolutely necessary, trees which will yield them should not be cut for fuel wood alone. Trees yielding woods of high general use are therefore recommended for farm planting. Probably macrocarpa (*Cupressus macrocarpa*) is the best, but detailed information upon this subject and upon the management of plantations can be obtained on application to the Director of Forestry, Wellington, or the Conservator of Forests, Auckland, Rotorua, Palmerston North, Nelson, Hokitika, Christchurch, or Invercargill.

Firewood should come from thinnings or improvement cuttings, which must be made periodically for the purpose of improving growth conditions and the quality of the remaining trees. Thinnings normally include (1) dead and suppressed trees which have been overtopped by others and their growth stopped or retarded; (2) trees diseased or seriously injured by insect-attack (these would include eucalypt trees damaged by scale insects, and insignis pine damaged by the steel-blue sawfly); and (3) crooked, large-crowned, short-boled, and "wolf" trees which are crowding and overtopping others. A properly managed plantation will after ten or twelve years yield on the average about one cord of thinnings per acre annually. If eucalypts are planted for firewood-production alone cutting can probably commence after eight years.

NATIVE BUSH ON AGRICULTURAL LAND.

On farms where small patches of native bush remain on valuable agricultural land, the fuel wood removed from them will meet the expense of clearing, and in other cases, where the weed trees of the native bush have by neglect encroached upon former pasture-land, fuel wood can be obtained in restoring the land to grass. Occasionally, too, some of the fast-growing introduced pines spread over agricultural land. Usually such trees will carry heavy branches and be of little use for rough-sawn timber, &c., so that in bringing the land into productivity again the clearing of the trees will yield a good supply of fuel wood.

LOGGING AND SAWMILLING WASTE.

Although many thousands of cords of firewood are obtained annually from logging and sawmilling waste, usually by sawmill employees and farmers adjacent to the operations, it is just as certain that a much wider market could be developed by direct sales of fuel wood from sawmillers to consumers in both rural and urban centres. Two or more householders can by pooling their orders secure a railway-truck of fuel wood containing about three cords, sufficient to carry them over the winter, at a price which will compete with coal and other fuels, especially for burning in open grates.

SEASON OF FELLING.

On most farms there are odd times when both men and teams are slack, and available for cutting and hauling firewood. Generally there is more spare time in the late autumn, winter, and early spring than at any other time of the year, and although these seasons naturally favour the felling and cutting of trees there is no good reason why, if labour is available, firewood should not be cut at any other time. One of the advantages of winter cutting is that the sprouts from hardwoods will grow during the succeeding spring and summer to such a size as to make them more resistant to winter killing than they otherwise would be; therefore, if reproduction is desired winter cutting is advisable with species which sprout. Winter-cut wood, too, will have become well seasoned for use the following winter. Independent firewood-cutters, however, usually commence operations in the spring and work on to the autumn, so that while the spring-cut wood is fairly well seasoned for early winter use, the autumn-cut material for use in the late winter has had comparatively little seasoning and is often fairly green.

FELLING AND CUTTING.

The method of felling and cutting adopted will depend upon the plantation, &c., and the plan of management in use. Thus, if the felling is part of a thinning operation in a close-spaced plantation the logs may be trimmed and dragged to the edge of the plantation, and there cut into 4 ft. cord wood or other suitable lengths and stacked ready for hauling to the farmhouse, whereas if clear cutting is adopted all three operations of felling, cutting, and stacking are probably most conveniently carried out immediately adjacent to the trees that are felled. When individual sticks are above 6 in. or 8 in. in diameter it is advisable to split them and when over 10 in. to 12 in. to quarter them. In the same way larger logs will be split to a size convenient for seasoning, for handling, and for sawing. Small trees are usually felled and cut into 4 ft. lengths with the axe, while larger trees are felled and cut with both axe and crosscut saw. Independent firewood-cutters sometimes employ power-driven crosscut saws for cutting up large logs. The quantity of wood which can be produced per man per day varies with the species of wood, the skill of the workman, &c. Thus an experienced worker will, in native bush, fell, cut into 4 ft. lengths, split, and stack only about three-quarters of a cord of rata per eight-hour day, whereas, clear cutting in small plantation timber, the same man will fell, cut, and stack as much as three cords of either softwood or hardwood per eight-hour day. The average worker will probably cut little more than half these quantities, so that the cost per cord will on a wage rate of 1s. per hour be about 16s. in the case of rata and 5s. in the case of plantation timber. Independent firewood-cutters, however, commonly receive as high as 10s. per cord for felling and splitting plantation timber, with an extra 2s. 6d. per cord for stacking alongside a road.

COST OF HAULAGE.

Because of its great bulk and weight when green, firewood is expensive to haul, and unless good level roads are available, and prices

are high, due to the market's remoteness from coal-producing regions, it is seldom economical to haul it over long distances. For all practical purposes the cost of team-hauling 4 ft. cord wood on fair country roads may be put at 2s. to 3s. per cord per mile. This is based on a two-horse-team wage-rate of 18s. per day, and from six to nine cord-miles per day (that is, four loads of one and a half cords for one mile or three loads of one and a half cords for two miles). By motor-truck the cost will probably vary from 6d. to 1s. per cord per mile, depending upon the condition of the roads and upon the species and dryness of the wood. When the wood must be hauled over fields, &c., the cost will be considerably higher. A good worker should be able to load or unload 4 ft. cord wood at the rate of three-quarters to one cord per hour.

SEASONING FIREWOOD.

Other things being equal, it is advisable to season firewood before hauling. This is readily appreciated when it is realized that some of the rapidly grown softwoods contain twice as much water as wood when freshly sawn. Proper seasoning will therefore give them greater heating-power, and make them lighter in weight and thus cheaper to handle.

The method of stacking to be adopted will depend upon the rapidity with which it is desired to season the wood. Commonly the wood is stacked in 4 ft. lengths in compact piles resting on two long bed-pieces, a practice which facilitates the measurement of the wood where it is being cut under a contract rate per cord. Seasoning, however, proceeds very slowly in such piles, and a more open type is desirable. The best form is built by placing two 4 ft. bed-pieces on the ground 4 ft. apart, and laying a course of 4 ft. lengths across them at right angles. On top of this course, and again at right angles, two more pieces are placed, and on these in turn another course, and so on until the desired height is attained. A modified form consists of placing alternate courses at right angles but leaving a fair space between the sticks in each course.

The essential to be observed is that a good circulation of air is secured throughout the whole pile, so that its location in an open field or other space free to the wind is preferable to any other. If the ground below can be cleared of vegetation, care taken that it is well drained, and the piles so constructed as to shed as much rain as possible, so much the better. Normally cord wood requires nine to twelve months seasoning, but even three months' good drying weather will reduce its moisture content to a point where it has about 90 per cent. of the fuel value of dry wood. Split wood dries more rapidly than round or unsplit wood, and barked wood more rapidly than unbarked wood.

SAWING AND SPLITTING.

For farm use firewood is normally required in from 8 in. to 18 in. lengths; and, while much of the cord wood and other length timber is still sawn into these sizes by hand, the use of inexpensive saw-tables and attachments for use with farm tractors is increasing. While a good worker will saw 4 ft. cord wood into 16 in. lengths at the rate of one and a half cords per day, a tractor-driven saw attachment will

enable him to work at three or four times that rate and to produce from five to six cords per day. The wood requirements on many farms will not warrant the expenditure on this attachment, but the cutting of supplies for other farmers and perhaps for sale to neighbouring townships may return a profit on the investment. After sawing, the stove wood may require further splitting. Some woods split very easily, but others, such as some of the eucalypts, are fairly difficult to split. Nevertheless a good worker should be able to split two or three cords per day without difficulty.

MEASURING FIREWOOD.

The commonest method of measuring firewood is by the cord, which consists of a pile 8 ft. long by 4 ft. high by 4 ft. deep, and therefore contains 128 cubic ft. of piled wood. After allowing for spaces between sticks, &c., there are from 60 to 100 cubic ft. of solid wood and bark, depending upon the type of firewood—whether it is a softwood or hardwood, whether it is round or split, or whether it is trunk or branch wood. Cord wood is sometimes piled 2 in. to 3 in. higher than 4 ft. to allow for shrinkage and settlement. For all practical purposes a cord may be assumed to contain 80 cubic ft. of wood.

HOW TO BURN WOOD.

The secret of efficient wood-burning is to restrict the amount of air passing through the bed of the fire, since wood requires for its combustion only half the amount of air required for the combustion of coal. For this reason in adapting any coal-burning equipment, whether in stove, fireplace, or furnace, it is essential to use either a finer grate or to limit the air-space by placing a piece of sheet iron over a large part of the grate. It may even be advisable to place the fire directly on the base of the fireplace and dispense with the grate.

To keep up a good wood fire it is further necessary to maintain a plentiful supply of ashes. As the blocks burn an accumulation of glowing charcoal forms in the ashes, and keeps on burning slowly, assisting the fresh blocks to ignite. The fire may be banked for many hours by shovelling ashes lightly over all the burning wood. Special wood-burning stoves are in common use, but special attachments are also procurable for the ordinary type of stove. In open fireplaces wood makes an excellent fuel, affording both heat and ventilation. It can also be used economically in combination with coal.

Comparative Heating-value of different Fuel Woods.

DRY WOOD.

As most woods are of the same basic chemical composition, equal weights of wood substance should give about the same amount of heat regardless of the species. In point of fact, the presence of resin, gums, tannins, &c., as well as water present in varying amounts, causes the various woods to have different heating-values, the presence of resins, &c., increasing the heating-power by as much as 12 per cent. The heating-value of thoroughly air-dry wood may, however, be conveniently assumed as averaging about 8,200 British thermal units,

one B.Th.U. being the amount of heat required to raise the temperature of 1 lb. of water through one degree Fahrenheit. A pound of coal will yield widely varying amounts of heat, according to its type. Southland lignite, for instance, will yield only about 6,300 B.Th.U., whereas Waikato or Southland brown coal will yield 10,000 B.Th.U., and Westland bituminous coal about 14,300 B.Th.U. per pound of dry coal, so that dry wood is over 30 per cent. more efficient than Southland lignite, but only fifty-eight per cent. as efficient as Westland bituminous.

DRY VERSUS GREEN WOOD.

In making comparisons between wood and coal, however, it is necessary to take account of the moisture present in both. When any fuel containing water is burned, part of the heat it is capable of yielding must be expended in raising the water to the boiling-point, converting it into steam, and raising this steam to the temperature of the flue gases. To deal with 1 lb. of water in this way requires about 1,220 B.Th.U., and the greater the amount of water present, clearly the more the heat lost. Thus one cord of pondosa pine (*Pinus ponderosa*) when freshly cut will contain in its 80 cubic feet some 1,820 lb. of dry wood substance and some 3,080 lb. of moisture, so that its net heating-value is—

$$\begin{aligned} 1{,}820 \times 8{,}200 &= 14{,}900{,}000 \text{ B.Th.U.} \\ \text{minus } 3{,}080 \times 1{,}220 &= 3{,}800{,}000 \text{ B.Th.U.} \\ &= 11{,}100{,}000 \text{ B.Th.U.} \end{aligned}$$

Fairly well seasoned, however, the same cord will contain only 600 lb. of moisture, so that its net heating-value is—

$$\begin{aligned} 1{,}820 \times 8{,}200 &= 14{,}900{,}000 \text{ B.Th.U.} \\ \text{minus } 600 \times 1{,}220 &= 700{,}000 \text{ B.Th.U.} \\ &= 14{,}200{,}000 \text{ B.Th.U.} \end{aligned}$$

The dry cord is therefore $(\frac{142}{111} \times 100) - 100$, or 28 per cent. more valuable as a fuel than the green cord, and demonstrates the value of seasoning firewood.

WOODS GROUPED BY THEIR HEATING-VALUES.

Since the heating-value of 1 lb. of thoroughly dry wood substance is approximately constant, irrespective of the species, it follows that the greater the density or weight per cubic foot of a wood the greater its heating-value per cubic foot or per cord. As a great deal of firewood is commonly measured and sold on a cord basis, it is convenient to classify the various woods on a density basis and to compare their heating-values.

Group 1.—This, the most valuable group, averages about 50 lb. of dry wood substance per cubic foot, and includes the heavy native hardwoods as follows:—

Northern rata (*Metrosideros robusta*).
Southern rata (*Metrosideros lucida*).
Black maire (*Olea Cunninghamii*).
Puriri (*Vitex lucens*).
Pohutukawa (*Metrosideros tomentosa*).
Manuka (*Leptosperum* spp.).

Group 2.—This next group averages about 38 lb. per cubic foot, and includes the beeches (*Nothofagus* spp.), with the exception of the silver-beech (*N. Menziesii*).

Group 3.—The third group comprises the lighter native hardwoods, the heavier native softwoods, and some of the heavier introduced eucalypts (hardwoods), their average density oven-dry being about 32 lb. per cubic foot, and the principal species being as follows:—

Native Hardwoods.	*Native Softwoods.*
Tawa (*Beilschmiedia tawa*).	Matai (*Podocarpus spicatus*).
Taraire (*Beilschmiedia taraire*).	Miro (*Podocarpus ferrugineus*).
Kamahi (*Weinmannia racemosa*).	Rimu (*Dacrydium cupressinum*).
	Kauri (*Agathis australis*).

Introduced Hardwoods.

Blue-gum (*Eucalyptus globulus*).
Peppermint-gum, &c. (*Eucalyptus amygdalina*).

Group 4.—In the fourth group fall the light native hardwoods and softwoods, the heavier introduced softwoods, and the lighter eucalypts, their average density oven-dry being about 26 lb. per cubic foot, and including the following species:—

Native Hardwoods.	*Native Softwoods.*
Silver-beech (*Nothofagus Menziesii*).	Kahikatea (*Podocarpus dacrydioides*).

Introduced Hardwoods.

Tasmanian Stringybark (*Eucalyptus obliqua*).

Introduced Softwoods.

Macrocarpa (*Cupressus macrocarpa*).	Austrian pine (*Pinus austriaca*).
Insignis pine (*Pinus radiata*).	Douglas fir (*Pseudotsuga Douglasii*).
Corsican pine (*Pinus laricio*).	European larch (*Larix Europea*).

Of these probably macrocarpa is the best.

The choice of wood for fuel does not, however, depend upon its heating-value alone. There are other factors of importance, such as freedom from smoke, ease and completeness of combustion, rapidity of burning, sparking, &c. Kauri, for instance, tends to smoke badly, and such woods as hinau (*Elaeocarpus dentatus*), pukatea (*Laurelia novae-zelandiae*), and rewarewa or honeysuckle (*Knightia excelsa*) are so difficult to burn, even when seasoned, that they are seldom used by themselves for firewood. Tawa and taraire burn very rapidly, but are useful in that they will burn when quite green, while totara (*Podocarpus totara*), silver-pine (*Dacrydium Colensoi*), and macrocarpa tend to spark.

HEATING-VALUE OF VARIOUS GROUPS.

Assuming, as in the investigation of the heating-value of dry and green pondosa pine, that fairly well-seasoned firewood contains about 33 per cent. of moisture based on the oven-dry weight of the wood, we find that the net values of the four groups per cord are as follows:—

$$\text{Group 1} = (80 \times 50 \times 8{,}200) - \left(\frac{80 \times 50 \times 33}{100} \times 1{,}220\right)$$

$$= (32{,}800{,}000 - 1{,}600{,}000) = 31{,}200{,}000 \text{ B.Th.U.}$$

Similarly,

Group 2 = 23,700,000 B.Th.U.
Group 3 = 20,000,000 B.Th.U.
Group 4 = 16,300,000 B.Th.U.

The relative values of Groups 2, 3, and 4 expressed as percentages of Group 1 are therefore 75, 64, and 52 respectively.

These heating-values can now be used to establish relative prices per cord for the various groups. For every £1 per cord that the buyer is willing to pay for woods in Group 1 he should not pay, if he is obtaining equal heating-value, more than 15s., 12s. 6d., and 10s. for woods of Groups 2, 3, and 4 respectively. Conversely, for every £1 per cord that he pays for woods of Group 4 he will obtain equal heating-value by paying £1 4s., £1 9s., and £1 18s. for woods of Groups 3, 2, and 1 respectively.

COMPARISON BETWEEN CORDS OF WOOD AND TONS OF COAL.

In some coals, such as the Westland bituminous, the moisture content is negligible, but in the lignites and the brown coals allowances of 35 per cent. and 15 per cent. respectively must be made for moisture similar to that in wood. The net heating-values of the various coals per ton are therefore—

Westland bituminous—

$$14{,}300 \times 2{,}240 = 32{,}100{,}000 \text{ B.Th.U.}$$

Brown coals—

$$(10{,}000 \times 2{,}240) - \left(\frac{2{,}240 \times 15}{100} \times 1{,}220\right) = 22{,}000{,}000 \text{ B.Th.U.}$$

Lignite—

$$(6{,}300 \times 2{,}240) - \left(\frac{2{,}240 \times 35}{100} \times 1{,}220\right) = 13{,}100{,}000 \text{ B.Th.U.}$$

One cord of seasoned Group 1 woods is therefore equal in heating-value to 1 ton of Westland bituminous coal; one cord of seasoned Group 2 woods equal to 1 ton of brown coal; and $\frac{2}{3}$ cord and $\frac{1}{3}$ cord respectively of seasoned Groups 3 and 4 woods equal to 1 ton of lignite.

DEFINITION OF "CO-OPERATIVE DAIRY COMPANY."

THE following reply was made recently by the Director of the Dairy Division to a correspondent who inquired as to what constitutes a co-operative dairy company:—

For the purposes of Part III of the Dairy Industry Act "co-operative dairy company" is defined as follows:—

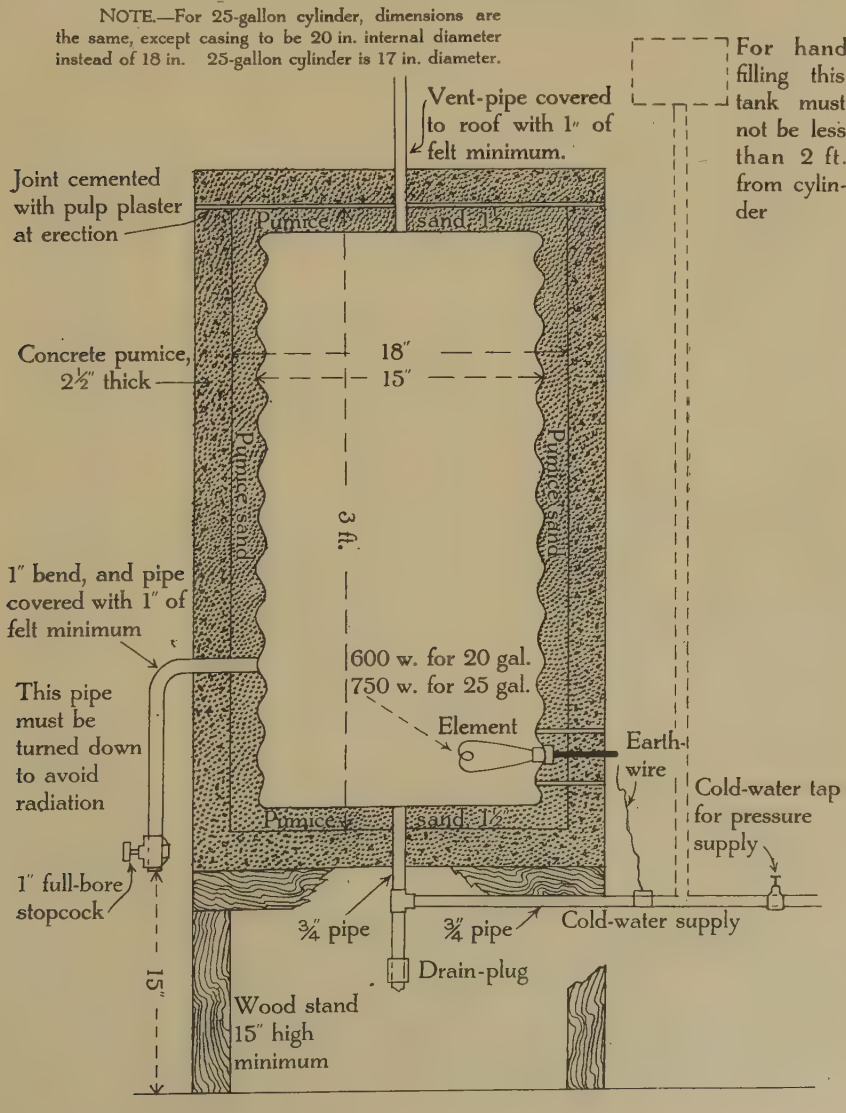
> In this part of this Act the term "co-operative dairy company" means a company which is incorporated under the Companies Act, 1908 (whether before or after the coming into operation of this Act), and the principal object of which is the manufacture of butter, cheese, dried milk, casein, or other article from milk or cream supplied to the company by its shareholders, or the collection, treatment, and distribution for human consumption of milk or cream so supplied to the company.

As we understand it, the phrase "the principal object of which," as used above, means that a dairy company in order to qualify for the use of the term "co-operative" should receive from its shareholders at least one-half of the butterfat supplied to the company.

ELECTRIC WATER-HEATER FOR DAIRY-FARMS.

Dairy Division.

In most milking-sheds where electric power is available, especially where the charge for current is on the number of pounds of butterfat produced, the electric water-heater will be found to be a very convenient appliance. Its efficiency will depend upon the construction of the heater and the size of the element provided. Trials conducted by officers of the Dairy Division have shown that the heater illustrated here—the design of which was kindly supplied by the Manawatu-Oroua Electric-power


NOTE.—For 25-gallon cylinder, dimensions are the same, except casing to be 20 in. internal diameter instead of 18 in. 25-gallon cylinder is 17 in. diameter.
For hand filling this tank must not be less than 2 ft. from cylinder
Vent-pipe covered to roof with 1" of felt minimum.
Joint cemented with pulp plaster at erection
Pumice sand 1½"
Concrete pumice, 2½" thick
18"
15"
Pumice sand
3 ft.
1" bend, and pipe covered with 1" of felt minimum
600 w. for 20 gal.
750 w. for 25 gal.
Element
Earth-wire
This pipe must be turned down to avoid radiation
Cold-water tap for pressure supply
1" full-bore stopcock
¾" pipe
¾" pipe
Cold-water supply
Drain-plug
15"
Wood stand 15" high minimum

Board—gives very satisfactory results, the 20-gallon size being suitable for a four-cow milking-plant. It should be noted, however, that as the heating element does not operate while the motor is running any use made of the power between milkings, such as wood-sawing, &c., will result in the loss of heat in the water for the following milking.

THE CASTRATION OF PIGS.

Live-stock Division.

YOUNG male pigs as a rule are castrated at about four to six weeks of age, and whether intended for bacon or pork it is not advisable to leave them longer than this if the best results are to be obtained by both the raiser and the consumer.

It is preferable to fast the young animals beforehand, or castrate in the early morning. The seat of operation should be washed with a weak solution of Condy's fluid or lysol, and the young pigs allowed to return to the sty, which in the interval should have a clean bed of dry straw provided, in order to prevent the wound coming in contact with the floor or any dirty material which might give rise to sepsis or abscess formation. If straw bedding is not available the pigs should be liberated in a clean grass-paddock.

The incision through the skin and outer coverings of the testicle should be a bold one, extending from one end of the testicle to the other. Such an incision permits proper drainage afterwards, whereas the effect of a small incision is to leave pockets where pus can accumulate. Cleanliness should be observed throughout the operation, the knife being returned to the vessel containing the antiseptic when not in use.

Improper or partial castration, or leaving the animals to mature further before the operation is carried out, results in coarser flesh and even tainted meat. Carelessness in the operation, with abscess formation in the scrotum or in the neighbouring parts may result in condemnation either wholly or partially by the Inspector at the works. It will be realized that abscesses in the region of the scrotum constitute a serious matter, in that the hams are the most valuable part of the carcass.

At the present time too many pigs arrive at the abattoirs and slaughterhouses throughout the country improperly or carelessly castrated, and requiring the attention of the Inspector. Indeed, so prevalent are troubles due to faulty castration that some buyers, in order to protect themselves and their employers, are now examining by palpation all pigs before purchase. There is no compensation for such animals partially condemned on this account, and the buyer is only protecting his firm when buying at a reduced price pigs which with a little care could have fetched the highest market figure.

The losses to the pig industry from this cause must be considerable. It is estimated that 3 per cent. of pigs coming forward may be partially or wholly condemned as a result of improper castration alone. Pig-farmers in their own interests, therefore, should see that reasonable care will amply reward them in the enhanced return from the sale of a sound and wholly marketable product.

SEASONAL NOTES.

THE FARM.

AUTUMN-SOWN WHEAT.

AUTUMN wheat can be taken after grass or clover, rape, cereals, peas, potatoes, or linseed. The crop usually does best after clover or rape; if taken after grass the land should be skimmed early to allow the sod to rot before the wheat is sown. Good crops are often obtained after potatoes, provided sowing is not unduly late.

Wheat requires a fine, firm seed-bed—the fine soil at the bottom and the clods at the top. Small lumps on the surface of a field of autumn-sown wheat are no disadvantage; the clods break down in the winter and provide a loose surface, preventing the land from caking hard in the early spring. Grassland intended for wheat should be skim-ploughed any time between the end of November and the middle of March. After lying for about six weeks the surface should be disked and the land cross-ploughed 6 in. or 7 in. deep. The surface can then be levelled with the harrows, and the final tilth given with the disks and harrows. The cultivator should not be used, as it is inclined to drag any undecayed vegetation to the surface. The two ploughings of grassland for wheat are very necessary, in order to allow the vegetation to decay and to obtain a fine, firm seed-bed. Early skim-ploughing gives virtually a summer fallow, and allows the land to absorb the autumn rains.

Land after peas, rape, linseed, or a cereal can be worked down after ploughing with the harrows, disks, and cultivator. In this case the cultivator is a necessary implement when the land is cloddy, as it brings the clods to the surface and shakes the fine soil to the bottom, thus making a good seed-bed for the crop. Care should be exercised in the use of the roller for breaking clods on wheat land, as it is liable to consolidate the surface and cause it to set. If the roller is used it should be followed with the cultivator to loosen the surface again.

Recent research work has shown that the wheat crop should be manured with 1 cwt. of superphosphate per acre. Manuring at this rate has given increases in yield of 3 to 8 bushels per acre, with an average increase of 5 to 6 bushels. About two-thirds of the wheat in Canterbury is now manured, and a large part of the unmanured area occurs on land where wheat follows grass, as it is generally considered by farmers that land after grass is in a high state of fertility, and does not require fertilizers. Experimental work, however, indicates that wheat taken after grass responds as well to phosphates as wheat taken in any other place in the rotation.

Wheat manured with superphosphate usually ripens one to four days earlier than wheat that is not manured or that sown with

other phosphates. Hence it is often stated that wheat sown with superphosphate "blights off" or does not "carry on." In all experiments, however, where wheat sown with superphosphate has ripened earlier than that sown with no manure or other phosphates there has been a good increase in yield. Also, the greater the hastening in maturity the greater the increased yield. Improvement in yield due to superphosphate may, however, occur without hastening maturity.

Last season's experimental work indicated that nitrogen top-dressing in the spring, in addition to the phosphate application at the time of sowing, is likely to be a sound manurial practice. Further information on this point will be gained when the results of this season's experimental work are published. There is no experimental evidence yet in favour of the use of potash in wheat-manuring.

The common varieties grown in our wheat-growing areas are Solid-straw Tuscan, Hunter's, and Velvet Chaff Pearl. Solid-straw Tuscan is the best wheat for windy districts, as the straw is filled with pith and is very rigid, so that it does not thresh about in the wind. Hunter's is a popular variety for medium wheat-growing soils; it yields well, produces a large amount of green feed, and can be fed off fairly close. Velvet Chaff Pearl is a wheat of very high milling-quality, but is only grown on medium land of even quality where the whole crop will ripen at once, as the grain is loose in the chaff and liable to shake.

For autumn and winter sowing the seeding varies from 1¼ to 1½ bushels. The seed should be pickled for stinking-smut control before sowing. The common practice is to use formalin pickle on the farms, but a good deal of the seed is now treated in bulk with copper carbonate. The latter method consists in dry-dusting very finely divided copper carbonate on to the wheat at the rate of 2 oz. per bushel. As the powder is poisonous if breathed in quantity, the dusting is usually done in a closed rotating cylinder. The advantages of this method are that large quantities of seed can be treated by machinery at seed-cleaning plants. The seed may be treated any time before sowing, and the germination is in no way injured.

Wheat will not stand flooding to any extent in the winter-time. Any hollows in the wheat-fields should have surface drains made to carry off any standing water that may collect after rain.

OATS AND BARLEY.

Autumn oats usually follow a cereal or an early fed-off fodder crop. The seed-bed requirements are similar to those already mentioned for the wheat crop. Algerians for chaff and Garton's for grain are the common varieties sown in the autumn. Both varieties produce very palatable green feed in the spring; Algerians can be fed off with the greatest severity, but Garton's should be quickly eaten down once and then left alone. The autumn seeding is 1½ to 2 bushels, and the crop should receive 1 cwt. of super per acre.

Barley for malting is sometimes sown in the autumn, but care must be taken that the land selected is dry in character and situation in the winter, as barley is killed out if the land is subject to winter flooding.

PASTURE MANAGEMENT.

The main points in connection with the early autumn top-dressing of pastures were dealt with in last month's notes. It should be remembered that early top-dressing with quick-acting phosphates, particularly superphosphate, increases the late autumn and early winter production of grass, and hence increases the winter carrying-capacity. Before pastures are top-dressed in the early autumn all rank growth should be grazed or mown off, and the field thoroughly chain- and tripod-harrowed as soon as the droppings have been sufficiently softened by rain to render them easy to spread.

—*P. W. Smallfield, B.Ag., Fields Superintendent, Auckland.*

MINOR OPERATIONS ON YOUNG STOCK.

Nearly every farmer in season castrates and tails his lambs, dehorns his young cattle, castrates his calves and pigs, and may even perform other operations such as opening abscesses, &c. In every procedure of a surgical nature thorough cleanliness of the site of operation, sterilization of knives and other instruments by boiling, and care and cleanliness with the aid of antiseptic solutions afterwards, are all essential to success. For the young farmer who has not yet undertaken such work a practical demonstration by an experienced man is the best method by which he can acquire technique and success. It is essential before operating that the operator's hands should be thoroughly clean, particular attention being paid to the fingernails.

If any ram lambs are discovered at this season of the year which have straggled or are not required for stud purposes, their castration requires even greater care than that of young lambs operated on at the proper season. It is not always recognized that the castration of a lamb of five or six months of age or older is attended with some considerable risk. A suitable method of castrating such animals is by means of the Burdizzo instrument. If the ordinary method is adopted there is danger of the animal dying either from hæmorrhage or from infection of the scrotal wounds.

HANDLING OF FAT LAMBS.

The handling of fat lambs between the paddock and the killing-pen is a considerable factor in maintaining the quality and value of the exported product. The first consideration is to reduce the time of travelling to a minimum, as prime lambs lose condition very rapidly, especially in hot or muggy weather, and with loss of condition the bloom is not likely to be as good. It is therefore advisable to minimize travelling as much as possible, yarding and loading expeditiously, and forwarding at the time specified by the freezing-works.

Considerable losses occur through lamb carcasses having to be second-graded owing to bruising, which is due to three main causes :

(1) Pulling of the wool; (2) dogging; and (3) bad trucking. The first results in numerous hæmorrhagic spots, usually on the back, and detracting much from the appearance of the carcass when dressed. The second often involves severe hæmorrhages of the legs, and sometimes the brisket, possibly causing the rejection of the lamb for export. The results of the third item are shown in broken ribs and legs, and sometimes internal hæmorrhages in the region of the loin and kidneys.

Regarded singly, these faults may not cause much loss to each individual farmer, but at the works the large wastage that occurs is seen at a glance by the rows of rejects.

—*Live-stock Division.*

THE ORCHARD.

EXPORT TRADE.

THE picking of the later varieties will soon be engaging the attention of exporters. While the picking of immature fruit is to be discouraged, it is very necessary that the later varieties should be picked and shipped as soon as ready; if unduly protracted, there is a danger of this fruit arriving at its destination in faulty condition, and also clashing with the advent on the overseas market of the locally grown new season's fruit. Pears especially should suffer little delay between picking and despatch. Sturmer apples require specially careful handling, as they bruise so readily; often one sees this variety badly damaged even in the picking. The parts of grading-machines with which the fruit comes in contact, if not cleaned frequently, become coated with the natural grease from the fruit, which in turns picks up grit, causing excessive scratching and marking of the fruit. Such marks are not always apparent at the time, but show up shortly after packing.

Some of the oustanding faults in connection with the preparation of export fruit may also be noted now, and possibly these may be rectified in further consignments. Damage to fruit at the side of the case where the bulge is excessive is caused in lidding. This may be avoided by pressing apples which are more or less resting on the edge of the case towards the centre. End apples are often damaged where the ends are packed too high, especially where through irregular sizing the pocketing is faulty and the pack loses its springiness. The ends may be kept lower by pressing the end apples into position in each successive layer, as this has a tendency to squeeze the apples towards the centre and to build the pack higher there.

The necessity for the use of well-seasoned timber in cases is obvious. However, where exporters are dependent on local supply and arrangements have been made for spread delivery, trouble is often experienced late in the season on account of dry cases having been used up and nothing but unseasoned cases coming to hand. Such cases are debarred from immediate export, and should also be debarred from local cool stores. Where, however, growers are dependent on such supply it is advisable to make the cases up

immediately and stack loosely in the open, preferably out of the sun to avoid warping and splitting, but rather under trees where there is a good draught.

STORAGE OF FRUIT.

Fruit intended for cool storage requires careful grading and packing. Firstly, it is requisite that only fruit of good quality should be selected for storage. It is a doubtful undertaking commercially to store fruit other than of popular sizes or of good colour and appearance. It is foolish to pay heavy storage charges on rubbish; the heavy charges can be carried by first-class fruit only. Fruit intended for long storage should be picked at a stage of maturity not too advanced, and no delay should occur in getting it into store after picking. Grading for the purpose of eliminating damaged fruit should be done carefully and thoroughly, otherwise rots developing in such fruit may spread to sound fruits in contact, causing a considerable decrease in the bulk packed out after storage, and for which full storage charges have been paid. It is advisable not to wrap fruit for cool store, but rather to make arrangements to repack and wrap after withdrawal. Fruit should be looked over at intervals, otherwise certain lines may deteriorate to such an extent as to become unmarketable, though they could have been marketed in sound condition earlier. Larger sizes should be separated in the cool store and made easily accessible for earlier marketing.

The same care and treatment as that given to fruit intended for cool storage should be extended to fruit being held in ordinary storage. Grading out to sizes allows of the disposal of larger sizes and the poorest keepers first. The elimination of damaged fruit should be just as strict, as conditions for the development of rot is more favourable than in cool storage. Fruit held in ordinary storage should be provided with good ventilation, but not subjected to the full blast of winds, otherwise excessive wilt occurs. Frequent cleaning-up of the packing-shed is very desirable, in order to get rid of all reject, diseased, and rotting fruits.

DISEASE CONTROL.

Although the season's spraying operations have in most instances been brought to a conclusion, a little attention here and there may assist greatly in connection with future work. San Jose scale may be noted on certain trees during picking-operations, and should be marked for special treatment when the late dormant sprays are being applied. Odd fireblight infections are often located at picking-time; these should be dealt with at the time, or conspicuously marked and dealt with at the earliest opportunity. Trees affected with silver-leaf might also be marked for removal later.

—N. J. Adamson, Orchard Instructor, Hastings.

Citrus-culture.

With the mild autumn temperature and good rains the citrus-trees will rapidly put forth new growth of rather a soft character. It is desirable that such growth should become hardened before even slight frosts are experienced; therefore nitrogenous fertilizers

should not be applied at this season of the year, or the growth will be even more rapid and soft. Phosphatic and potassic manures should be applied during early April; 8 cwt. of super plus 2 cwt. of sulphate of potash per acre is a good average dressing. This should be distributed prior to the autumn working of the land, so that it may be turned under with the plough.

Seasonal working of the soil should aim at leaving the contour so as to provide an easy get-away for heavy rains which may be expected later. Grading should be done so that no hollows are left to accumulate water near the rooting-area of the trees. Now is a good time to sow a cover-crop for turning under later. Blue lupins are best for the purpose, and provide the greatest bulk of green material to plough in; oats and tares or Lotus angustissimus are also quite good. Among young trees, especially where shelter is poor, lupins may be grown right up the trees; they provide quite a beneficial cover.

Where it is intended to extend or plant new areas, orders for trees should be lodged with the nurseryman, as there is likely to be a shortage of citrus-trees during the coming planting-season.

—W. H. Rice, Orchard Instructor, Auckland.

POULTRY-KEEPING.

PREVENTION OF COLDS IN THE YOUNG STOCK.

THE time of year is now approaching when harder weather conditions may be expected. Therefore the matter of making the pullets comfortable by good feeding and special care (as a means of encouraging them to produce dear-season eggs in good numbers) should have first consideration on the part of the poultry-keeper. Even the pullet which is bred to lay in winter will fail to produce sufficiently if everything in the chain of management is not in her favour.

Above all things, care should be taken in every possible way to prevent the young birds from catching colds. The sleeping-quarters should be well ventilated but free from draughts, while on no account should the birds be overcrowded. Neglect of these important details is only inviting trouble in the form of colds, the forerunner of that dreaded disease roup. The most common symptoms of colds are sneezing, eyes watering, and a discharge from the nostrils, to which dust and dirt usually adhere. Once a cold makes its appearance in the flock every endeavour should be made to find the cause and remove it at the earliest possible moment, while isolation of the affected birds is the only safe course. A good plan at this time of the year to prevent colds is to place some Condy's crystals into the drinking-water. Put half a teaspoonful of the crystals into a pint bottle of water, and add a teaspoonful of this mixture to about 2 quarts of drinking-water.

It may be repeated that the aim of the poultry-keeper should be to prevent even a slight cold from making its appearance, by removing all sources favourable to its development. It should be

remembered that the curing of colds involves considerable labour, and that even when a cure is effected the trouble is likely to recur at any time unless the cause is removed. A cold may be treated successfully, but once the roup stage has been reached (indicated by offensive breath and a swelling or cheese-like substance protruding from the eye) it will usually pay to destroy the bird at once rather than attempt to doctor it. A simple method of treating colds is to take a shallow dish, fill it with pure kerosene, and dip the bird's beak in this sufficiently deep to cover the nostrils. Hold the bird in this position till it breathes. This will have the effect of drawing the kerosene to the base of the trouble. Repeat the treatment on alternate days until a cure is effected. In applying this treatment care must be taken to prevent the kerosene from getting on the face of the bird, as it is apt to have an injurious effect. The nostrils should be covered and no more, while the dipped parts should be wiped with a dry cloth after immersion.

MOULTING OF PULLETS.

Disappointment is often experienced at this period of the year owing to pullets going into a moult from no apparent cause, and just when the market value of eggs is on the upgrade. This is usually due to underfeeding, or the supplying of food which is not palatable to the birds; it may also be brought about through moving the birds from one house to another. Especially is this the case when the pullets have commenced to lay or are on the point of laying. This implies that all pullets bred to lay in winter should be placed into their permanent quarters without delay. In addition the treatment they receive must be regular and uniform to a degree. Of course, as a general rule, the very early hatched birds, particularly of the lighter breeds, will lay a few eggs in the autumn and moult with or before the adult stock, and this very often regardless of having received the best possible management. Usually when pullets go into an early moult their owners adopt the plan of changing the food, under the impression that the food is responsible. This is a mistake (providing, of course, that the food is sound and palatable), as putting the birds on a new diet will only make matters worse. A bird will always come back to lay much quicker when there is no drastic alteration in her treatment. The treatment may be all right, but any change will not improve matters. Pullets when commencing to lay usually possess a nervous temperament, and any alteration in the methods under which they are kept will cause them to fret, and thereby intensify any unfavourable condition to which they have been subjected.

CROSSBREEDS VERSUS PUREBREEDS.

Inquiries frequently reach me as to the best breeds to cross with a view to producing heavy-laying stock. This is a question that cannot be answered with any degree of satisfaction, for at the best the crossing of different breeds may be regarded as a hit-or-miss system of breeding, as compared to breeding from fixed types of purebred strains. It is a common but a mistaken opinion, when profitable egg-production is to be maintained, that the crossbred

bird is better to keep for this purpose than the one from pure-bred parents of one particular breed. An argument often brought forward in support of crossbreeding is that the chickens will usually grow better, and generally make greater progress than purebreds. Maybe they do, and will return an equal profit, but only when size and table qualities are the chief objects aimed at. With regard to heavy egg-production, however, we have no proof that the cross-bred bird can be bred with any degree of certainty for this special purpose.

On the other hand, the records put up in the egg-laying competitions give striking proof of the value of various purebreds for high egg-production. It must be admitted that many of the birds which have produced high egg-records at the competitions, and which were generally regarded as purebreds, gave striking evidence that foreign blood had been introduced as a short-cut to heavy egg-production. There is also striking evidence that many of these birds with mixed blood have failed to produce their like when placed in the breeding-pen, and as a result became a source of annoyance and disappointment to breeders into whose hands they fell. It is not the number of eggs laid by the bird which determines her real value, but the power to transmit her laying-powers to her offspring. Many valuable lessons in regard to the management of poultry have been taught per medium of the egg-laying competitions, and probably the most important one yet demonstrated is the great superiority of purebred stock as compared with crossbred or barnyard fowls.

THE BREEDING COCKERELS.

Many poultry-keepers, after selecting the most promising cockerels for future breeding-purposes, place them in small coops or confined quarters. In order that the birds may make special growth they then provide them with plenty of rich nourishing food, and give them special care and management. This is a mistake, as such conditions do not tend towards promoting vigorous and healthy growth. It stands to reason that feeding rich foods to a bird and curtailing its exercise during the growing stage will have the effect of encouraging size of body beyond that which the undeveloped legs are capable of carrying. Confinement is necessary in fattening cockerels, but it is most undesirable in the case of those it is intended to breed from. Not only does it have the effect of overforcing the birds—a common cause of leg-weakness—but also results in falling-over combs as well. In the building-up or maintenance of a heavy-laying strain stamina in the male is of supreme importance. One cannot suggest a better way of promoting this than by giving the growing bird a good range under the most natural conditions possible. Naturally this should go hand in hand with good feeding and housing, and general efficient management.

—*F. C. Brown, Chief Poultry Instructor, Wellington.*

THE APIARY.

AUTUMN MANAGEMENT.

In case all surplus honey has not been removed by the time these notes appear beekeepers would be well advised to use bee-escapes, as indicated in last month's notes. There is a grave risk of starting robbing unless extreme care is exercised in removing honey so late in the season. However, the use of bee-escapes will, with ordinary care, enable the beekeeper to complete his operations in comfort and without the interference of robber bees, which are particularly active at the close of the flow.

In some districts after the autumn rains a small flow of honey may be experienced, sufficient to meet the daily needs of the colony, with some to store for winter food. It is well, however, to make sure that the colonies have a sufficient supply of honey on hand to winter well; thus an estimate of stores should be made when the remainder of the surplus is taken. In most districts it is good practice to leave not less than 40 lb. of honey for each colony's requirements, while in some districts 60 lb. will be a safer estimate. It must be remembered that it is in autumn the beekeeper is laying the foundation for the next season's crop; therefore he should concentrate in wintering his bees well. The three main factors to be observed are strong colonies, abundance of stores, and queen-right hives.

As the season advances supers not fully occupied by the bees should be removed and stored away.

UNITING COLONIES.

As advised last month, all weak and queenless hives should be united. The golden rule of modern beekeeping is to keep all colonies strong, and this applies specially to the autumn months, when weak colonies are in danger of being robbed. If by any chance late swarming and weak colonies from defective queens have to be dealt with the procedure recommended is as follows: After taking the roof and mat from a queen-right hive, place a sheet of newspaper immediately over the top of the frames, and carefully place the queenless colony on top. Little smoke will be required if the colony is gently handled. Weak colonies should be similarly treated. There is no need to remove one of the queens, as the bees will decide which they will keep.

ROBBING.

Robbing is the result of carelessness, and once it has started is exceedingly hard to check. Do not expose honey, sugar-syrup, or anything that the bees can rob. See that the honey-house is bee-proof, and that all combs and vessels containing honey are removed to a place of safety. Contract all hive-entrances, and especially guard against leaving hives open in a way that they can be attacked by robbers. All operations must be carried out quickly. If robbing has started it is better to postpone all outside work until the apiary is quiet again than to risk extending the trouble by opening the hives. Should a colony be attacked, contract the

entrance and pile wet grass in front of the hive. This will usually cure mild cases of robbing, but where a colony has been overpowered by the robbers it should be closed altogether.

CARE OF EXTRACTING-COMBS.

If proper care is not to be exercised in storing the extracting-combs when removed to the honey-house, it is far better that they should be stored in the hives. If the latter plan is adopted the mats must be placed on top of the brood-chamber, and the supers tiered above the mats. Unless the apiary is well sheltered, however, the hives must be weighted, as the winter gales will easily overset them when only empty combs are stored inside. It is far better to remove the combs if it can possibly be done, and thereby obviate the labour of lifting the supers if it becomes necessary to examine the brood-chamber. But in this case the combs must be properly housed to secure them from destruction by mice and wax-moths. It is not uncommon to find tiers of extracting-combs destroyed as the result of carelessness. Mice are especially destructive, and the damage they will do in a short period is such as to render the greatest trouble worth while in preventing them from gaining access to the combs. The price of foundation now ruling is making it far more costly to produce combs, and if large numbers have to be annually produced the renewals become a severe tax on the season's profits.

During extracting many combs may become damaged, but the damage can be repaired by the bees when the combs are returned to the hives. As a rule, however, mice destroy the combs beyond repair, and no effort on the part of the bees can restore them to their original form. It is during the working-season that the bee-keeper realizes the value of combs in securing a crop. A shortage of combs during the flow will often prevent the bees being kept in working-trim, and the production of honey will be greatly restricted. Mice destroy the combs to gain access to the pollen, and render them foul and offensive to the bees.

In the absence of a mouse-proof room the combs can be stacked in supers tiered one above another. Be sure that there are no holes or cracks in the supers through which the mice can obtain an entrance. Place a queen-excluder at the bottom of the tier and another on the top. Queen-excluders, if used as described, are a complete success in preventing mice from destroying the combs during the off-season. Should the wax-moth be detected the combs must be fumigated. Bisulphide of carbon is generally used for destroying insect-life, but it should be used with great caution, as it is highly inflammable. It is far better when storing the combs at the end of the season, to place a few moth-balls among them. This will be sufficient to prevent the attack of the moths.

CARE OF EQUIPMENT.

As soon as the honey has been disposed of, thoroughly clean all utensils used in handling the crop. Remove all traces of honey from the extractor, tanks, uncapping-knives, &c. Wash carefully

with boiling water, and dry thoroughly to prevent rusting. The high cost of equipment should impel the beekeeper to take great care in storing his plant during the off season. It is advantageous to use loose washing-covers of close texture to cover the tanks and extractor. The covers will help to keep the untensils free from dust that is likely to accumulate during the winter. See that all metal parts likely to rust are given a good coating of oil. In season or out of season the watchword of the beekeeper in the extracting-house should be cleanliness.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

GREEN-MANURING.

In the past the usual method at this season following the harvesting of a crop was, under some circumstances, to plough in a heavy dressing of stable manure by way of preparing the land for the next crop, and with cheap supplies this was a quick and efficient method of reconditioning land. With the ever-increasing use made of motor vehicles and traction in place of the horse, that supply is now seldom available, and while chemical fertilizers to some extent supply the need, they do not afford the humus and fibre that were supplied to the land by stable manure. These valuable ingredients are now obtained by sowing the land to be treated with a green cover-crop, and, when mature, ploughing it in and allowing it to decay—a slow method which in the case of valuable land is a serious cost, as the time could otherwise be devoted to growing a marketable crop. For this reason many growers are inclined to starve the land for want of these supplies.

Experience will doubtless improve our methods in this direction, but meanwhile it is necessary to see that each area has reasonable attention of this kind periodically. By selecting cover-crops of a hardy nature they may be grown during the winter, when the land can best be spared from growing crops that are directly marketable. At this season, as soon as a market crop is harvested, disk or harrow down the land and sow a hardy green crop. The fertilizers in the ground will soon assist it to make a strong growth, which will keep the land clean, and mature in time to be turned in and decay before the spring planting. With the proper use of lime dressings this method can be relied upon to greatly assist in keeping the soil in good order.

THE VEGETABLE GARDEN.

A sowing of the large mild white Italian onion made now should be ready for harvesting in spring and early summer, when such onions are in great demand for salads. Warm, sheltered slopes where the soil is good may be sown down in dwarf green peas for a first early crop. Seed-beds may be made and sown with main-crop cabbage, cauliflower, and cabbage lettuce, the intention being to allow these plants to stand over for planting out in early spring. For this purpose sow rather thinly. Cauliflower and cabbage for early spring cutting should now be planted out from seed-beds into a piece of good

well-drained land. Complete earthing up the celery crop. Cut down the asparagus growth level with the ground as soon as it ripens and before the seed falls.

Potatoes, onions, pumpkins, &c., should be harvested as they mature, the keeping-qualities largely depending on how this is done. Pumpkins are best cut and allowed to remain for a while as they grew before gathering them; they should then be stored in a dry, airy place.

TOMATO GLASSHOUSES.

Tomato glasshouses will yield a good crop all the easier next season if they are well cleaned up now as required. Where insect or fungus troubles have been epidemic during the season, or have shown a tendency to become so, the present time affords the best opportunity of dealing with it. In such cases clean up the house and land well, and sow down the latter with a suitable green cover-crop, leaving ample ventilation on.

SMALL-FRUITS.

The preparation of land intended for strawberries should now be completed, and delivery obtained of the plants as soon as they are available. When they arrive, open up the bundles and air them. Trim up the roots and tops, and set out the plants as soon as the weather and the condition of the ground permit. This operation is facilitated if a fine, even, firm surface is first obtained. It is important to plant only varieties proved suitable to the locality, and to obtain the plants from a supplier with a reputation for careful selection. Experiments with new varieties are important, but they should first be tried on a small scale only.

Land to be planted out in bush fruits should now receive attention. Most of these plants have fibrous roots near the surface, which preclude deep cultivation after planting. For this reason deep and thorough preparation is necessary now. Place the order for plants without delay; supplies of this kind are usually short. Obtain delivery as soon as the plants are ready for lifting, and heel them in carefully; they will then be ready for planting out when required.

WALNUTS.

This valuable crop is worth careful attention. Too often the local sample compares badly with the imported nuts, although their intrinsic value is appreciated by the consumer. With a little more attention in harvesting, the local nuts might obtain a decided preference on the market. Gather the nuts as soon as there is a fair picking on the ground, and thus avoid stained shells. It is of some assistance to shake the branches with a long boathook-like implement. Sweet, well-flavoured kernels are obtained by thorough curing. For this purpose the nuts may be spread on shallow trays and thoroughly dried, going through them occasionally and turning them over. Avoid drying them too quickly in a hot sun, or nuts that are poorly sealed will open. Afterwards shake them in wire riddles of a suitable size to dispose of small nuts and litter, and finally pick them over, removing broken and blighted nuts, also those with husks adhering. They have then only to be bagged up ready for marketing.

—W. C. Hyde, Horticulturist, Wellington.

REVIEW.

"THE VEGETATION OF NEW ZEALAND."

Die Vegetation der Erde: XIV, The Vegetation of New Zealand. By L. Cockayne, Ph.D., F.R.S., F.N.Z.Inst. XXVI + 456 pages; 107 figures on 87 plates, and three maps. Second edition, entirely rewritten, thoroughly revised, and enlarged. Wilhelm Engelmann, Leipzig, 1928. 42s., cloth-bound 45s.

"It is hardly possible to conceive a property or stores manager carrying on the management of a large estate or general store and yet being unaware of the stock at his disposal, the extent of his supplies or their nature. And yet this is, in the main, the position of the British Empire, its tropical colonies and protectorates in general, and even, to a certain extent, its great Dominions, so far as one of its greatest assets — natural vegetation — is concerned. No inventory of the vegetational assets of the Empire has been attempted, nor, so far as is known, is any officially contemplated." So write Professor Tansley and Dr. Chipp in their preface to "Aims and Methods in the Study of Vegetation" (1926). To remedy this state of affairs a "British Empire Vegetation Committee" has recently been set up. To the thoughtful New-Zealander, living in a land greatly endowed by nature, this committee should appeal as deserving every support. But New Zealand has not waited for this committee to function; indeed, in this "stock-taking" New Zealand has lead the way and serves as a model to other portions of the Empire.

Botanically considered, New Zealand is a *multum in parvo*. With its wide range of latitude, its diversified coast-line, its great mountain-chains, its volcanic areas, its glacial lakes, its wide river-beds, its rainfall ranging from under 20 in. per annum to over 100 in., it offers multitudinous growing-places for plants of varied forms and demands. We have the mangrove communities of northern estuaries, the subtropical rain-forests of the north, the subantarctic rain-forests of the south, the grasslands and deserts of the Volcanic Plateau, the great tussock plains of Canterbury, the rich subalpine flora and vegetation of north-western Nelson and the Southern Alps, swamps, bogs, coastal dunes and cliffs, rock-faces of diverse aspect and contour, the magnesian soil of the mineral belt, and so on almost endlessly. Then there are the differing elements of the flora—Malayan, Polynesian, Australian, Subantarctic, to name some—superimposed upon the palæozelandic element of the long-distant past. Then there is the long isolation of the land from other land masses, and its romantic and chequered geological career. The vegetation, as a result, presents a complicated picture, to match which bits would have to be taken from many countries. To elucidate all this, to marshal the facts, to analyse the vegetation and flora into their component parts and to reduce all to order, so that he who runs may read, would seem almost a superhuman task. Yet it has been done, and New Zealand should be proud of those who have accomplished the work.

We remember specially the pioneer and fundamental labours of the great Hooker in providing the correct names of the plants with which we have to deal, and the work of those who continued on the lines laid down—notably, Kirk, Petrie, and Cheeseman. Only with this work as a basis could the vegetation itself be properly studied. In this regard we owe our knowledge almost entirely to the genius, energy, and perseverance of one man—Leonard Cockayne. The ecological work of this eminent botanist—commencing in 1887 and still being actively prosecuted—is crowned by the publication of the volume now under review. It will be hailed by ecological botanists the world over not merely as a complete work of reference on its subject, but as a model of what is required for all countries. Nor has Dr. Cockayne's influence on taxonomic botany—the study of the systematic status of the individual plants and their grouping into different classes—been any the less profound. Indeed, the taxonomic procedure of the whole botanical world is being vastly influenced by his discovery of the part played by hybridism in the New Zealand flora, and its bearing on the question

of "species" and their evolution. Evidence of this will be found throughout the present volume, and will be closely studied by all concerned with such problems.

To state that this second edition is really a new book is no exaggeration. In 1904 Dr. Cockayne was invited by Professor A. Engler to contribute a volume on the plant-geography of New Zealand to the great series being published by Wilhelm Engelmann under the title, "Die Vegetation der Erde." With characteristic enthusiasm Dr. Cockayne flung himself into the task, and the work was published in 1921. It at once achieved its mark. This first edition was reviewed in this *Journal* for August, 1922 (p. 125). It is there said, "Dr. Cockayne is not primarily concerned in his book with the economic aspects of plant ecology, but no serious student of any of the branches of agricultural science can read the work without feeling that a new power of vision has been acquired by him —that the different plant communities with which he has to deal—pasture, field-crop, or forest—are subject to laws of infinite variety and subtlety, and that even the partial elucidation of some of these laws will confer on agriculture gifts as yet undreamed of."

This is still more true of the new edition, where the economic applications are often directly suggested, and the book must be read as a whole for its lessons to be thoroughly learned. It is indeed a new work, more logically arranged, with a more philosophical outlook, and with still more adequate treatment of detail. One may mention, as examples, the fuller treatment of problems of succession—the changes occurring in the nature of the vegetation on a particular area from period to period; the use of particular cases to elucidate phenomena of general occurrence; the new treatment of the individuals concerned and their status, especially the consideration given to hybridism and to epharmony—the response of the individual to diverse conditions of its different growing-places. To quote from the preface: "That the making of a book so greatly changed was possible is due in large measure to my having botanically re-explored much of the Region, thanks especially to the carrying-out of plant-ecological studies at all altitudes of the tussock-grassland and forest areas for the Department of Agriculture and the State Forest Service respectively." Generous acknowledgment is made of the assistance of other workers—those workers themselves inspired by the example and whole-hearted encouragement and support of their master.

The book is divided into five parts. Part I gives in lucid manner those preliminaries essential to the proper understanding of what follows, and should be closely scanned by the student. We have the necessary definitions of the terms used for both vegetational and floristic units. The history of botanical investigation records all work of moment accomplished up to the date of publication, and is followed by a full and valuable bibliography. Concise and illuminating descriptions are given of the physiographical features of the region, its soil-types, and its climate. Part II gives a remarkably full picture of the primitive vegetation and semi-primitive vegetation. This is based on definite and careful notes taken in the field over many years, and the part will remain a standard treatise on its subject. As the years go by and the face of New Zealand is more and more altered, so the more will this record be enhanced in value—a permanent memorial of what our land was before the march of civilization entered upon its destroying course. It is true to say that the picture given is so complete and accurate that there remain, in large measure, only minor details for younger students to fill in before it is too late. Throughout are given statistical summaries, the result of laborious work so punctiliously performed that it is indeed difficult to catch our author tripping. The part is divided into three sections in which we study the vegetation of the sea-coast (Mr. W. R. B. Oliver, Director of the Dominion Museum, contributes a brief account of the seaweed communities), of the lowlands and lower hills, and finally of the high mountain areas. A fourth section deals with the outlying islands—the Kermadecs, Chatham, and subantarctic islands. In each section, before the discussion of the actual plant-communities, we are given a mental picture of the leading species, their growth-habits, their seasonal changes, their epharmonic modifications, and other biological matters.

To most readers of this *Journal* the chapters on the grasslands will have an especial appeal and utility. The great types of tussock-grassland — the low tussock-grassland dominated by *Festuca novæ-zelandiæ* and *Poa cæspitosa*, and the tall tussock-grassland dominated by *Danthonia Raoulii* — are discussed in considerable detail, and matters fundamental to their management may be gleaned.

The reader will then be in a position to profit more fully by the practical papers published by the author in this *Journal* under the title "An Economic Investigation of the Montane Tussock-grassland of New Zealand" (1919 onwards).

Part III, dealing with the effect of settlement upon the plant-covering of New Zealand, should be read in detail by all who are "on the land." It may also be commended to the study of all legislators or prospective legislators. It is in following up the work dealt with in this part that the new generations of botanists will find their great ecological task. Here to hand is a common-sense and workable preliminary classification that will serve as a basis for further study. We have (1) the "modified communities," which are altered to a greater or lesser extent from their primitive condition; (2) the "indigenous-induced" communities, composed of or at least dominated by indigenous species, but not existing in primitive New Zealand (danthonia grasslands is an example of great importance to the farmers); (3) the "exotic-induced" communities, composed of or dominated by species of exotic origin, *e.g.*, blackberry thickets; (4) the "artificial" communities created directly by man, *e.g.*, rye-grass pastures. Much of practical moment yet remains to be discovered, and future changes will have to be studied and recorded. A true realization of the status and relative importance of our "weed" flora is essential to progress. Consider, for example, the statement, "Thus, in the great tussock-grassland formation, nearly all the exotic edible plants possess palatability to a far higher degree than do the indigenous ones." There is a clear discussion of the effects of burning the tussock, a question still much debated. A brief account of the artificial communities (*e.g.*, the replacement of fern-heath by artificial grassland), from the pen of Mr. A. H. Cockayne, Director of the Fields Division of the Department of Agriculture, and a chapter on the agriculture and horticulture of the Dominion, add to the value of this part.

Part IV, giving the distribution and composition of the flora, while of more technical interest, contains under each botanical district a statement of the agricultural and pastoral practice there. It is seen that the division into natural districts (six in North Island, eight in South Island) according to the flora and vegetation agrees very well with the division according to farm practice. A chapter on the families, genera, and elements of the flora is of considerable phytogeographical interest. We find that the ferns and flowering-plants total 1,843 species belonging to 109 families and 383 genera, and that 78·6 per cent. of these are endemics or purely New Zealand species. The great importance of the recognition of the prevalence of wild hybrids is fully brought out, as are the relationships of the flora with those of Australia, the Subantarctic Region, Malaya, and Polynesia. The conclusion is drawn, "The flora of New Zealand, notwithstanding its strong endemism, possesses two very distinct elements not floristic only, but ecological." The first is a combination of the palæozelandic and subantarctic elements—a temperate element; and the second is made up of the descendants of an ancient palæotropic stock.

Part V deals very briefly with the history of the flora. The author considers that "the origin and subsequent history of the New Zealand flora is, in great measure, a matter of speculation merely." On the "burning" question of ancient land-connections the author is in favour, on the whole, of the belief in a land "bridge" at some time antecedent to the advent of mammals on the connected area. The problematical history of the flora following on the changes of land surface during the different geological ages, concludes the chapter.

The illustrations, which are excellent and representative of the chief plant communities discussed, are grouped together after a complete index of plant-names. The two clear maps showing the botanical districts and many of the chief localities referred to add greatly to the utility of the book. Printed in large type well differentiated on heavy glazed paper, the work shows a great improvement in format on the first edition, and reflects great credit on the enterprising publishers, who have served science so well in entering upon this series of studies of the world's vegetation.

The book has been seen through the press by Professor L. Diels, Director of the great Botanic Garden and Museum of Berlin. He has discharged his voluntary and onerous duties brilliantly, letting slip few errors of any kind. That he should have undertaken the work is sufficient proof of the esteem in which Dr. Cockayne is held abroad, and of the high place he holds in the botanical world.

H. H. ALLAN.

WEATHER RECORDS: FEBRUARY, 1929.

Dominion Meteorological Office.

GENERAL NOTES.

FEBRUARY was a very dry month, the far southern portions of Otago and Southland being the only part of the Dominion to receive more than the average rainfall. Numbers of places in Canterbury recorded no rain at all. South of Dunedin rain fell on a fair number of days, but elsewhere almost the whole of the month's precipitation occurred during the first five days, and most of it on the 1st and 2nd.

Meteorologically the month was a quiet one. There was a comparative absence of wind, the prevailing direction being south-westerly. The thundery conditions of the previous months were not maintained. Thunderstorms were reported, however, from a number of stations on the 3rd, and a hailstorm in the Oamaru district did much damage to vineries at Kakanui. Temperatures and sunshine were above normal.

The continued dry weather caused pastures to become very parched during the latter half of the month, and milk-yields have declined. Otherwise stock are reported to be in good condition, and the dry spell was advantageous to the extent that it checked the rank growth of feed produced by the heavy rains of the earlier months. Reports indicate fair or good yields from crops of all sorts, and harvesting and haymaking have been carried out under favourable conditions.

The strongly developed monsoonal conditions over Australia which characterized January were again in evidence in February. Pressures were low for most of the time in northern Australia. These low pressures were counterbalanced by a stationary high-pressure system over the Tasman Sea, which was responsible for the prevalence of south-westerly winds over New Zealand and the dry weather which prevailed between the 6th and the 23rd. The area of low pressure extended eastward from tropical Australia during the third week of February, and a cyclone developed between Fiji and the New Hebrides. The centre passed close to the Kermadec Islands on the 21st, but the effect on New Zealand weather was slight.

The rain during the first days of the month was due to a deep depression of the southern or westerly type, which was centred in the South Tasman Sea on the 1st. This was followed by a series of secondaries, of which the last crossed the Dominion on the 5th. There were northerly gales in Cook Strait on the 2nd, and southerly gales round the southern extremity of the South Island between the 5th and the 7th.

From the 23rd to the end of the month another series of depressions of the westerly type affected the South Island, but the rain was confined practically to the west coast and far southern districts.

—Edward Kidson, Director of Meteorological Services, Wellington, 6th March, 1929.

RAINFALL FOR FEBRUARY, 1929, AT REPRESENTATIVE STATIONS.

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average February Rainfall.
	North Island.				
		Inches.		Inches.	Inches.
1	Kaitaia	0·34	5	0·12	2·95
2	Russell	0·21	3	0·10	3·20
3	Whangarei	0·20	1	0·20	4·46
4	Auckland	0·61	6	0·39	3·06
5	Hamilton	0·82	4	0·48	2·96
6	Kawhia	2·05	7	1·66	2·66
7	New Plymouth	1·06	6	0·54	4·00
8	Riversdale, Inglewood ..	1·61	5	0·85	6·30
9	Whangamomona	0·80	2	0·40	4·23
10	Eltham	1·06	5	0·98	3·37
11	Tairua	0·44	2	0·40	4·10
12	Tauranga	0·84	3	0·77	3·58

RAINFALL FOR FEBRUARY—*continued.*

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average February Rainfall.
	North Island –continued.				
		Inches.		Inches.	Inches.
13	Maraehako Station, Opotiki	1·04	1	1·04	3·48
14	Gisborne	0·37	4	0·20	3·63
15	Taupo	0·84	2	0·75	2·82
16	Napier	0·20	1	0·20	2·92
17	Maraekakaho Station, Hastings	0·41	3	0·39	2·52
18	Taihape	0·68	5	0·23	2·52
19	Masterton	0·28	4	0·16	2·70
20	Patea	0·94	5	0·60	2·51
21	Wanganui	0·76	2	0·65	2·52
22	Foxton	0·74	3	0·68	2·06
23	Wellington (Karori) ..	1·01	5	0·39	3·07
	South Island.				
24	Westport	2·76	9	1·45	4·37
25	Greymouth	5·38	15	1·14	5·99
26	Hokitika	4·44	15	1·80	7·31
27	Ross	5·43	7	2·88	8·45
28	Arthur's Pass	7·09	7	3·90	10·17
29	Okuru, Westland	5·10	5	2·40	7·92
30	Collingwood	2·24	4	1·90	5·63
31	Nelson	0·72	3	0·43	2·77
32	Spring Creek, Blenheim ..	0·37	3	0·26	2·25
33	Tophouse	1·30	5	0·63	4·39
34	Hanmer Springs	0·32	4	0·15	3·04
35	Highfield, Waiau	0·56	2	0·40	2·54
36	Gore Bay	0·55	3	0·25	2·93
37	Christchurch	0·10	4	0·04	1·77
38	Timaru	0·20	4	0·10	1·82
39	Lambrook Station, Fairlie ..	0·10	2	0·06	1·89
40	Benmore Station, Clearburn	0·46	3	0·34	1·36
41	Oamaru	0·61	4	0·26	1·68
42	Queenstown	1·19	4	0·67	1·98
43	Clyde	0·26	4	0·11	0·99
44	Dunedin	1·43	11	0·86	2·69
45	Wendon	1·18	7	0·40	2·03
46	Gore	3·34	13	0·90	2·65
47	Invercargill	4·40	19	1·75	2·85
48	Puysegur Point	5·15	18	0·96	4·96
49	Half-moon Bay	5·39	17	1·54	4·13

MYCOLOGICAL INVESTIGATIONS ABROAD.

NEW ZEALAND will be represented at the Second Imperial Mycological Conference, to be held in London next September, by Dr. G. H. Cunningham, Government Mycologist, Department of Agriculture, who has been in charge of the Plant Research Station at Palmerston North during the past year. Dr. Cunningham is leaving next month for the United States and Canada, where he will spend some three months in making investigations and personal contacts in his branch of science. He will then proceed to Europe for the Conference, and to undertake further important investigational and consultative work, both in Britain and on the Continent, this part of the tour also comprising a period of about three months. The return to New Zealand will be made via Suez in November next. The first Imperial Mycological Conference, held in London in 1924, was also attended for the New Zealand Government by Dr. Cunningham, then Mycologist at the Biological Laboratory of the Department of Agriculture, Wellington.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

MIXING OF LIME WITH FERTILIZERS.

"LIMESTONE," Rangiora :—

I should be glad to know whether if I mixed carbonate of lime with superphosphate the carbonate would act with the super on the crop for which it is sown, or would I have to mix burnt ground lime with the super to get results with the super. Also would carbonate of lime have a bad effect in liberating the nitrogen if mixed with blood-and-bone fertilizer ?

The Fields Division :—

As a general rule, a mixture of carbonate of lime and superphosphate will give good results on the crop for which it is sown. From the farmer's point of view the use of this mixture is quite a good practice, especially in connection with the sowing of turnips or other small seeds. Superphosphate should not be mixed with burnt lime. Carbonate of lime may be mixed with blood-and-bone fertilizer, but the mixture should be kept in a dry place.

PRAIRIE-GRASS AND CHICORY.

"ABC," Otane :—

I would be obliged for any information about prairie-grass and chicory, as to their suitability to a peat swamp which is wet in winter and dry is summer; also whether chicory is easily eradicated.

The Fields Division :—

Prairie-grass likes nice warm land, and cannot be recommended for a swamp wet in winter. The same may be said of chicory (*Cichonium intylus*), which is usually grown on dry hard land. Chicory would be easily killed by grubbing, but as stock eat it well it is not likely to become a pest.

FERTILIZER IMPORTATIONS: DECEMBER QUARTER.

FOLLOWING are the importations of fertilizers into New Zealand for the three months ended 31st December, 1928 :—

Sulphate of ammonia : United Kingdom, 480 tons; Australia, 100 tons; Germany, 7 tons; United States, 155 tons. *Nitrate of soda :* Chile, 500 tons. *Basic slag :* United Kingdom, 190 tons; Belgium, 1,545 tons; Germany, 15 tons. *Bonedust :* India, 25 tons. *Rock phosphate and guano :* United Kingdom, 5 tons; New Caledonia, 1,523 tons; Nauru Island, 41,500 tons; Makatea Island, 4,534 tons. *Phosphates (other) :* United Kingdom, 260 tons; Belgium, 781 tons; France, 75 tons; Egypt, 4,250 tons; Morocco, 3,687 tons. *Superphosphate :* Belgium, 10 tons. *Kainit :* France, 85 tons; Germany, 25 tons. *Muriate of potash :* Germany, 14 tons. *Sulphate of potash :* France, 315 tons; Germany, 311 tons. *Potash (other) :* France, 1,935 tons; Germany, 1,794 tons. *Sulphate of iron :* United Kingdom, 39 tons; Australia, 1 ton; Germany, 1 ton. *Other manures :* United Kingdom, 112 tons; Belgium, 150 tons; Germany, 19 tons.

Massey Agricultural College Council.—Mr. Arthur Morton, of Taranaki, has been appointed a member of this Council.

STATISTICS OF IRRIGATED LANDS.

FOLLOWING are particulars relative to irrigated lands in New Zealand for the years 1926–27 and 1927–28:—

Utilization of Irrigated Lands.	Area irrigated.	
	1926–27.	1927–28.
	Acres.	Acres.
Orchards	2,027	2,244
Green fodder and root crops	2,273	3,099
Pasture	49,942	50,201
Lucerne	2,165	1,290
Oats	428	316
Wheat	65	60
Barley	58	16
Market gardens	29	6
Other crops	46	8
Totals	57,033	57,240

—*Census and Statistics Office.*

AREAS IN ORCHARDS, MARKET GARDENS, AND NURSERIES.

—	1926–27.	1927–28.
	Acres.	Acres.
Market gardens (excluding potatoes of ¼ acre and over)	5,102	5,655
Nurseries and seed-gardens—		
Forest-tree seedlings	198	193
Other young trees and nursery stock, &c.	266	296
Vineyards	309	285
Commercial orchards—		
Bearing	19,036	18,283
Not bearing	1,245	1,581
Private orchards	5,096	5,123

"Commercial" orchards are defined for statistical purposes as "those producing fruit for sale to the value of £50 and upwards annually, or, if not in full bearing, or if for any reason the crop has been a failure, that are calculated to produce fruit for sale to that value when in full bearing or in normal seasons, as the case may be." This definition is one used for statistical purposes only, and has no reference to commercial-orchard districts under the Fireblight Act, 1922, or to orchards under the Orchard-tax Act, 1927. Private orchards, for statistical purposes, consist chiefly of small areas the produce of which is consumed principally on the holding, or, if sold, does not aggregate an annual value of £50.

For the 1927–28 collection of statistics special cards were sent out to orchardists, and this revealed a number of errors, particularly in classifying as "commercial" certain orchards which were incapable of producing sufficient revenue to be classed as commercial orchards.

—*Census and Statistics Office.*

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 13th December, 1928, to 7th March, 1929, include the following of agricultural interest :—

No. 55740 : Milking-machine ; E. J. Ellery and F. A. Stempa, Invercargill. No. 58155 : Fence standard ; Corkscrew Steel Fences, Ltd., Sydney, N.S.W. No. 58479 : Gate-hinge ; A. C. Honey, Greymouth. No. 61295 : Cure of foot-rot ; W. J. Bowes, Christchurch. No. 61481 : Sheep-shearing machine ; J. Davidson, Sydney, N.S.W. No. 59389 : Plough-share ; A. M. Eaden ; Ashburton. No. 59555 : Bleaching flax ; M. H. Wynyard, Onehunga. No. 59742 : Milking-machine pulsator ; G. J. Heaven, Masterton. No. 61108 : Potato-bagger ; A. B. Hayman, Willowbridge. No. 61322 : Chain-harrow link ; D. McL. Wallace, Ltd., Te Aroha. No. 61586 : Cheese-press ; J. B. MacEwan and Co., Ltd., Wellington. No. 61603 : Press for baling wool ; N. P. Cash, South Yarra, Victoria. No. 61642 : Distributing seed and fertilizer ; H. J. Sampson and H. D. Sampson, Ngaruawahia. No. 61712 : Apparatus for the production of butter ; J. Siedel, Cammin, Germany. No. 58412 : Manure broadcast distributor ; J. Rollo, G. S. Millar, and C. D. Chant, New Plymouth. No. 61765 : Cleaning fly-infested animals ; L. R. L. Bourgault du Coudray, Mauritius. No. 61859 : Flax-dressing machine ; N. C. Grigg, Drysdale, Victoria. No. 59064 : Automatic scutching-machine ; M. H. Wynyard, Onehunga. No. 60018 : Cream-separator driving means ; L. W. Hunwick, Wanganui. No. 60171 : Teat-cup ; W. E. Hunter, Whangarei. No. 60248 : Teat-cup support ; C. Swanson, New Plymouth. No. 60339 : Manufacture of butter ; E. Perks, Auckland. No. 60563 : Treatment of mammitis ; J. H. Godyer, Murray Bridge, Victoria, and A. J. Cooke, Glenelg, South Australia. No. 61797 : Seed-separating ; Warren-Teed Seed Co., Chicago, U.S.A. No. 61882 : Seed-separating process ; Warren-Teed Seed Co., Chicago, U.S.A. No. 61890 : Egg carton construction ; E. N. Hale, Buffalo, U.S.A. No. 61954 : Sheep-shearing machine comb-plate ; J. Davidson, Sydney, N.S.W. No. 61966 : Cattle-fodder ; J. E. Nyrop, Horsholm, Denmark. No. 59565 : Plough-lift ; J. C. Edie, Morton Mains. No. 59809 : Treatment of mammitis ; J. B. Bennett, Waitakaruru. No. 60088 : Packing live-stock for transport ; E. F. Mitchell, Melbourne, Victoria. No. 60092 : Treatment of mammitis ; E. R. Cotton, Matamata. No. 61459 : Manure-distributor ; J. E. Sedcole, Masterton. No. 61731 : Spool for barbed wire ; Pearson, Knowles, and Rylands Brothers (N.Z.), Ltd., Auckland. No. 61759 : Milking-machine releaser ; W. Drinkall, Te Aroha. No. 61832 : Distributor for manure ; J. G. Clark, Ohura.

Copies of full specifications and drawings in respect of any of the above may be obtained from the Registrar of Patents, Wellington, price 1s. prepaid.

AGRICULTURAL SHOWS, SEASON 1928-29.

THE following show-dates for the remainder of the season have been notified by agricultural and pastoral associations :—

Hawke's Bay A. and P. Society (Autumn Show) : Tomoana, 20th March.
Mayfield A. and P. Association : Mayfield, 23rd March.
Methven A. and P. Association : Methven, 27th March.
Oxford A. and P. Association : Oxford, 4th April.
Flaxbourne A. and P. Association : Ward, 18th April.

Bill Moose Linseed.—This variety of linseed, although a high yielder, often suffers from the fact that the straw is short and the crop difficult to harvest. A number of selections have been made by the Department of Agriculture indicating that the length of straw is quite variable, and some tall-strawed forms are being kept for further trial as to their yield.